# MODELS 811, 818, 820, 821, 860, 861, 20990, 20990S & 20994

MODELS 811, 820, 821, 860 & 861; CHASSIS E800D: RUNS 2-8

MODEL 818; CHASSIS K800D: RUNS 2-8

MODELS 20990, 20990S & 20994; CHASSIS J800D
BOOK NO. 94X766 5-51

# television

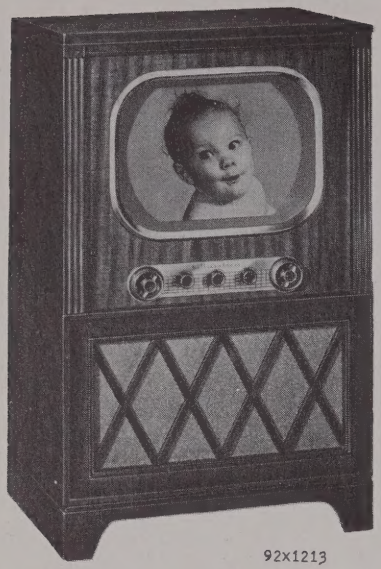
# SERVICE MANUAL

SERIES 800

MODEL 820 - - OLD WORLD MAHOGANY
MODEL 821 - - SANDSTONE OAK

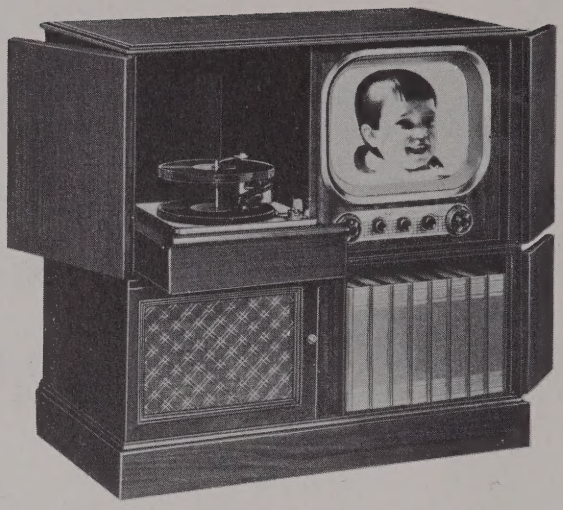
(SEE PAGE 2 FOR OTHER CABINET ILLUSTRATIONS)

the hallicrafters co.
MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 24, U. S. A.



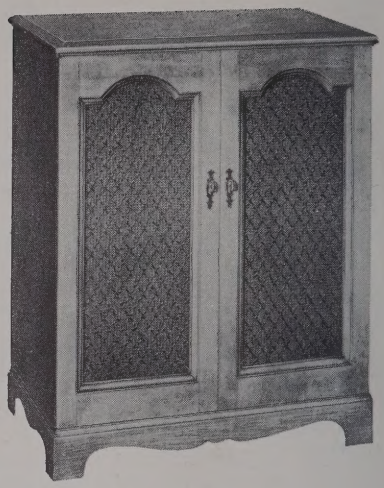
92X1213

MODEL 818--MAHOGANY
TV-AM RECEIVER WITH
16" ROUND PICTURE TUBE



92X1268

MODEL 860--OLD WORLD MAHOGANY
MODEL 861--SANDSTONE OAK
TV-AM RECEIVER WITH 16"
RECTANGULAR PICTURE TUBE
AND RECORD CHANGER



92X1459

MODEL 20990--MAPLE
MODEL 20990S--MAHOGANY
TV-AM RECEIVER WITH 20"
RECTANGULAR PICTURE TUBE
AND RECORD CHANGER

NOTE

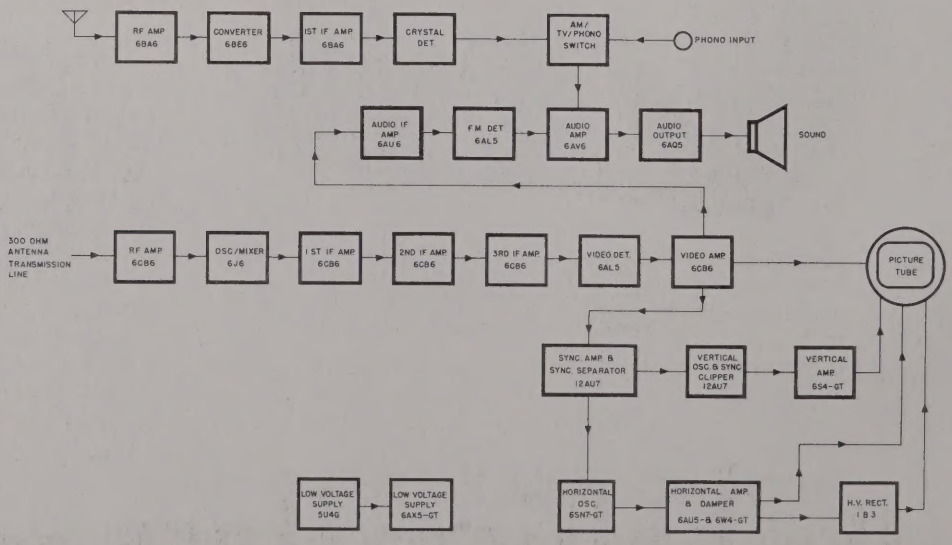
SERVICE INFORMATION ON THE RECORD CHANGER USED IN MODELS 860, 861, 20990, 20990S AND 20994 HAS BEEN PUBLISHED IN A SEPARATE BULLETIN.

92X1458

MODEL 20994--MAHOGANY TV-AM RECEIVER WITH 20" RECTANGULAR PICTURE TUBE AND RECORD CHANGER

92X1214

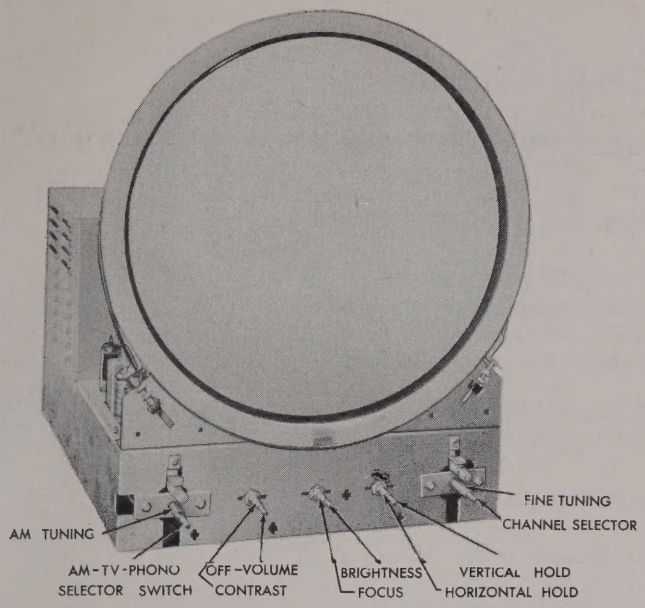
MODEL 811--MAHOGANY
TABLE MODEL TV-AM
RECEIVER WITH 16"
RECTANGULAR PICTURE
TUBE



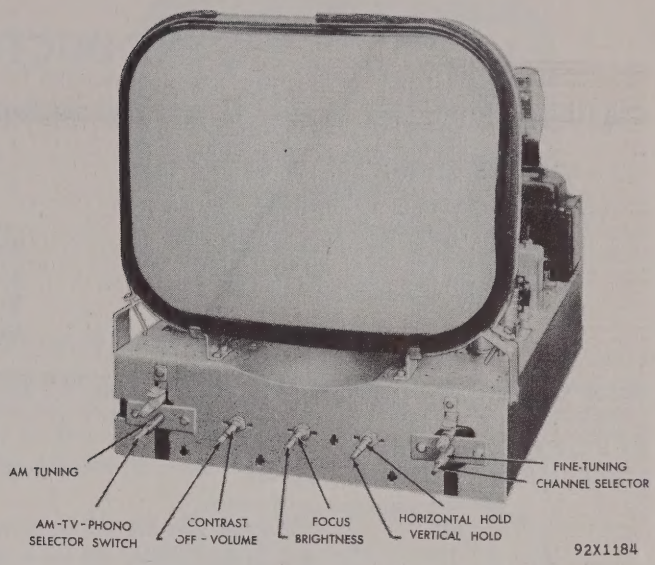

92D1197A

NOTE: FOR ALTERNATE TUBE TYPES REFER TO TUBE COMPLEMENT ON PAGE 3

FIG. 1. FUNCTIONAL BLOCK DIAGRAM




CHASSIS K800D FOR 16 INCH ROUND PICTURE TUBE




CHASSIS E800D AND J800D FOR 16 INCH AND 20 INCH RECTANGULAR PICTURE TUBES, RESPECTIVELY

FIG. 2. FRONT CONTROLS

# GENERAL SPECIFICATIONS

| | |
|---|---|
| ANTENNA (TV) | HALLICRAFTERS BUILT-IN SILVER VORTEX |
| ANTENNA (AM) | BUILT-IN LOOP |
| TUNING (TV) | 12 CHANNELS, 2-13 |
| TUNING (AM) | 535 KC - 1620 KC |
| PICTURE CARRIER I-F | 26.25 MC |
| SOUND CARRIER I-F | 21.75 MC |
| INTER-CARRIER | 4.5 MC |
| SOUND SYSTEM | |
| AM TUNER I-F | 455 KC |
| SPEAKER, MODEL 811 | 5 INCH PM |
| SPEAKER, MODELS 818, 820, 821 | 8 INCH PM |
| SPEAKER, MODELS 860, 861, 20990, 20990S & 20994 | 12 INCH PM |
| POWER SUPPLY INPUT | 110-120 VOLTS 60 CYCLES AC 235 WATTS |
| TUBES | 24, INCLUDING 3 RECTIFIERS |

# TUBE COMPLEMENT

| | | |
|---|---|---|
| V 1 | 6CB6 | RF AMPLIFIER |
| V 2 | 6J6 | OSC./MIXER |
| V 101 | 6CB6 | 1ST I-F AMPLIFIER |
| V 102 | 6CB6 | 2ND I-F AMPLIFIER |
| V 103 | 6CB6 | 3RD I-F AMPLIFIER |
| V 104 | 6AL5 | VIDEO DETECTOR |
| V 105 | 6CB6 | VIDEO AMPLIFIER |
| V 106 | 12AU7 or 6SN7 | SYNC. AMP. & SEP. |
| V 107 | 12AU7 or 6SN7 | SYNC. CLIPPER & VERTICAL OSC. |
| V 108 | 6S4 | VERTICAL AMPLIFIER |
| V 109 | 6AU6 | AUDIO I-F AMPLIFIER |
| V 110 | 6AL5 | AUDIO DETECTOR |
| V 111 | 6AV6 or 6SQ7 | 1ST AUDIO AMPLIFIER |
| V 112 | 6AQ5 | AUDIO OUTPUT |
| V 113 | 6AX5GT or 6X5GT | LV RECTIFIER |
| V 114 | 5U4G | LV RECTIFIER |
| V 115 | 6SN7GT | HORIZONTAL OSCILLATOR |
| V 116 | 6AU5GT or 6AV5GT | HORIZONTAL AMPLIFIER |
| V 117 | 6W4GT | DAMPER |
| V 118 | 1B3GT | HV RECTIFIER |
| V 119 | 16GP4 | 16" ROUND BLACK PICTURE TUBE FOR MODEL 818 |
| V 119 | 16RP4 | 16" RECTANGULAR BLACK PICTURE TUBE FOR MODELS 811, 820, 821, 860 & 861 |
| V 119 | 20CP4 | 20" RECTANGULAR BLACK PICTURE TUBE FOR MODELS 20990, 20990S, 20994 |
| V 201 | 6BA6 | RF AMPLIFIER (AM) |
| V 202 | 6BE6 | CONVERTER (AM) |
| V 203 | 6BA6 | I-F AMPLIFIER (AM) |

# HIGH VOLTAGE WARNING

OPERATION OF THE RECEIVER CHASSIS OUTSIDE OF THE CABINET INVOLVES DANGER OF ELECTRICAL SHOCK. EXERCISE ALL NORMAL HIGH VOLTAGE PRECAUTIONS WHEN WORKING WITH THIS RECEIVER.

# PRODUCTION CHANGES

Chassis in which minor changes or substitutions were made during production may be identified as follows:

| CHASSIS STAMP ON REAR APRON OR TOP OF CHASSIS | CHANGE OR SUBSTITUTION |
|---|---|
| A | Fuse F-101 added to the circuit |
| 1 | Tube type 6SQ7 substituted for type 6AV6 |
| 4 | Tube type 6SN7 substituted for type 12AU7 |
| 5 | Both of the above tube substitutions |

Note: Refer to the schematic diagrams (Figs. 28 and 30) for further information on circuit changes.

| CHASSIS STAMP (Under HIGH VOLTAGE control) | STAMP EXPLANATION |
|---|---|
| E | Chassis type E800D, 16 inch rectangular picture tube |
| J | Chassis type J800D, 20 inch rectangular picture tube |
| K | Chassis type K800D, 16 inch rectangular picture tube |
| C | Color Plug, PL-105, and Color Socket, SO-105, added to circuit; (see Fig. 30, Schematic Diagram). |
| T | Alternate power supply used; (see Fig. 30, Schematic Diagram). |
| 6 | FOCUS control, R-159, moved to the rear apron of the chassis into the HIGH VOLTAGE control position. The HIGH VOLTAGE control R-182, is deleted and B+ is tied directly to the plate of V-117, DAMPER. |
| 7 | HORIZONTAL HOLD control, R-171, moved to the rear apron of the chassis into the HORIZONTAL DRIVE control position. The HORIZONTAL DRIVE control R-176, and resistor R-174, are replaced by a 39,000 ohm 1/2 watt resistor (23X20X393K). The word "HORIZONTAL" on the front control knob escutcheon is eliminated. |
| 8 | Includes changes T, C, and 7. |

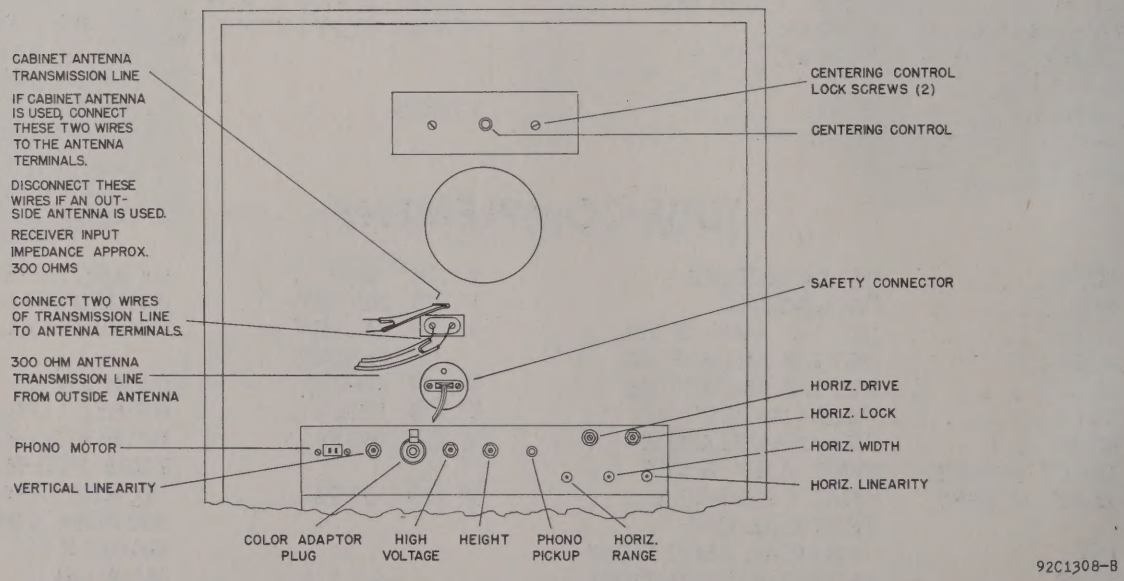



FIG. 3. REAR CABINET VIEW

# SERVICE ADJUSTMENTS

Note: The sequence of "SERVICE ADJUSTMENTS" outlined herein is suggested as a convenient method of approach and is not an arbitrary procedure. Variations of the procedure are permitted to obtain the final result.

The service adjustment controls normally will require minor adjustments if any circuit changes or tube replacements are made. The use of a test pattern, generated locally in the shop or obtained from a television station, is recommended for best adjustment results. The operating controls, located on the front apron of the chassis, should be set for as good a picture as possible before making the following adjustments.

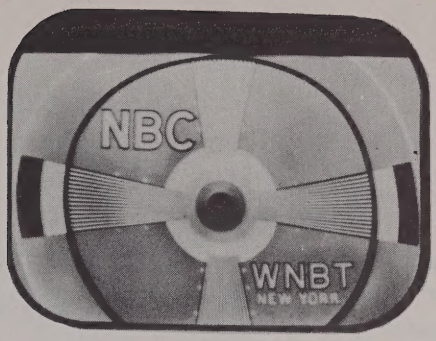



FIG. 4. IMPROPER CENTERING ADJUSTMENTS

If the picture is not properly centered, remove the two CENTERING CONTROL LOCK SCREWS and move the CENTERING LEVER a short distance in any direction required to recenter the picture. DO NOT use undue force in making this adjustment as excessive strain may be exerted on the neck of the picture tube. If proper centering cannot be restored in this manner, a slight readjustment of the deflection yoke mounting may be necessary.

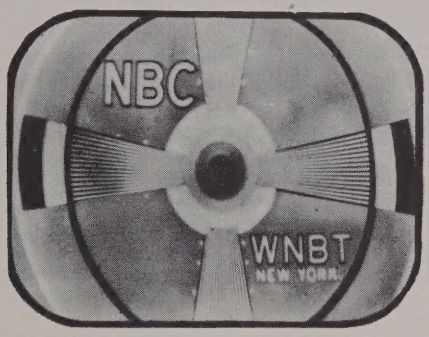



FIG. 5. IMPROPER HEIGHT CONTROL SETTING

FIG. 6. IMPROPER WIDTH CONTROL SETTING

Adjust the HEIGHT and WIDTH controls so that the picture fills out the dimensions of the screen. A slight re-adjustment of the CENTERING control may then be necessary.

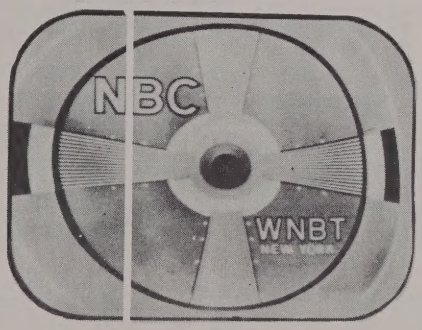



FIG. 7. IMPROPER HORIZONTAL DRIVE CONTROL SETTING

Adjust the HORIZONTAL DRIVE by advancing the control until a vertical white line appears in the pattern. Then turn the control in the opposite direction just a little further beyond the point at which the line disappears.

FIG. 8. IMPROPER VERTICAL LINEARITY CONTROL SETTING

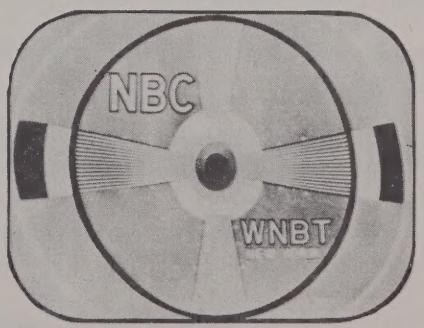



FIG. 9. IMPROPER HORIZONTAL LINEARITY CONTROL SETTING

Adjust the VERTICAL LINEARITY and HORIZONTAL LINEARITY controls for a symmetrical pattern. A slight readjustment of the HEIGHT and WIDTH controls may then be necessary.

TEST PATTERNS COURTESY RCA SERVICE CO.

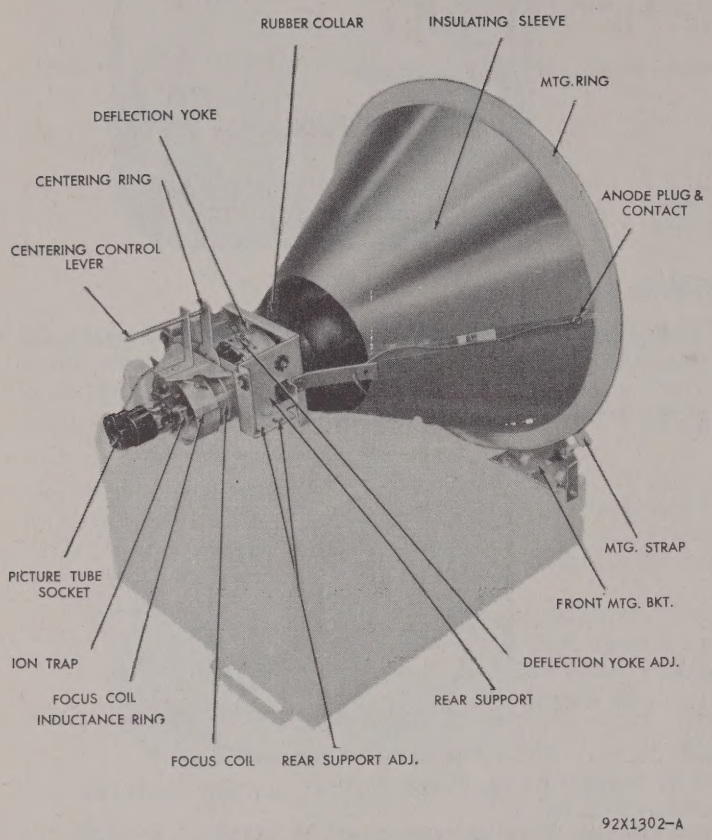



FIG. 10. PICTURE TUBE MOUNTING DETAIL (16" ROUND PICTURE TUBE)

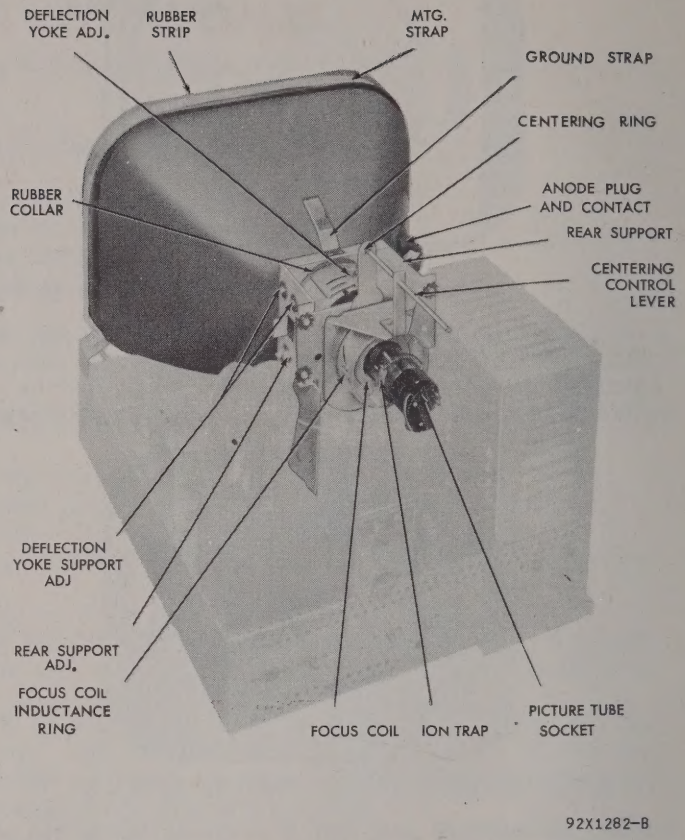



FIG. 11. PICTURE TUBE MOUNTING DETAIL (16" OR 20" RECTANGULAR PICTURE TUBE)

## REMOVAL OF THE CHASSIS FROM THE CABINET

1. Remove the knobs on the front panel by pulling in the forward direction.
2. Loosen the panel, mounted on the cabinet back, through which the CENTERING CONTROL LEVER protrudes, by removing the two CENTERING CONTROL LOCK SCREWS.
3. Remove the screw located directly above the SAFETY CONNECTOR.
4. Disconnect the built-in antenna leads from the antenna terminal strip.
5. Remove the cabinet back mounting screws and then remove the cabinet back.
6. Remove the speaker plug at the chassis. On the table model, remove the speaker mounting nuts and lift out the speaker.
7. Removal of the chassis may now be completed by removing the five chassis mounting screws (located at bottom of cabinet) and sliding the chassis from the cabinet.

## WARNING

## PICTURE TUBE HANDLING PRECAUTIONS

THE PICTURE TUBE ENVELOPE ENCLOSES A HIGH VACUUM. ANY ACCIDENTAL BLOW OR ROUGH HANDLING MAY CAUSE THE TUBE TO IMPLODE WITH DANGEROUS AND DESTRUCTIVE VIOLENCE. THE PICTURE TUBE SHOULD BE HANDLED ONLY BY QUALIFIED PERSONS PROTECTED BY HEAVY GLOVES AND SHATTERPROOF GOGGLES.

# REMOVAL OF THE PICTURE TUBE

1. Remove the chassis from the cabinet by following the procedure outlined on page 6.

2. FOR ROUND TUBES: Insure the discharge of the high voltage filter capacitor by shorting the ANODE PLUG (PL-104) to the chassis through a well insulated wire and disconnect the plug.
   FOR RECTANGULAR TUBES: Disconnect the ANODE PLUG (PL-104) from the side of the tube and short the plug to the chassis to insure the discharge of the high voltage filter capacitor. Discharge the aquadag coating by shorting the ANODE CONTACT of the tube to the outer tube coating.

3. Remove the TUBE SOCKET from the base of the tube.

4. Slip the ION TRAP from the neck of the tube.

5. Remove the MOUNTING STRAP from the front rim of the tube.

6. FOR ROUND TUBES: Loosen the four REAR SUPPORT ADJUSTMENT SCREWS. Raise the front of the tube just far enough for the polyethylene MOUNTING RING to clear the front mounting brackets and slip the tube forward until the neck is clear of the DEFLECTION YOKE and FOCUS COIL. Use a slight twisting pull to break the cone of the tube from the RUBBER COLLAR if the two are stuck together. The polyethylene MOUNTING RING and INSULATING SLEEVE should also be removed if a new picture tube is to be installed.
   FOR RECTANGULAR TUBES: Loosen the four REAR SUPPORT ADJUSTMENT SCREWS. Raise the front of the tube just far enough to clear the two stop pads on the front tube mounting brackets and slip the tube forward until the neck is clear of the DEFLECTION YOKE and FOCUS COIL.

CAUTION -- If the tube fails to slip out smoothly, investigate and remove the cause of trouble. DO NOT USE FORCE.

# INSTALLATION AND ADJUSTMENT OF THE PICTURE TUBE

1. FOR ROUND TUBES: Slip the INSULATING SLEEVE over the cone of the tube and fit the polyethylene MOUNTING RING around the front rim of the tube and over the INSULATING SLEEVE. Be sure that the ANODE CONTACT strap on the inner side of the INSULATING SLEEVE makes a good electrical contact with the rim of the metal tube cone. Position the polyethylene MOUNTING RING so that the ends of the ring come together approximately 90 degrees counterclockwise (when facing the front of the tube) from the ANODE CONTACT on the INSULATING SLEEVE.
   FOR RECTANGULAR TUBES: Place the RUBBER STRIP around the front rim of the tube. A large rubber band may be used to hold this strip in place. Position the tube so that the ANODE CONTACT is located at the left side of the tube when viewed from the front of the screen.

2. FOR ROUND TUBES: Slip the neck of the tube through the RUBBER COLLAR, DEFLECTION YOKE, and FOCUS COIL. Seat the groove of the polyethylene MOUNTING RING on the two rubber strips which are attached to the front tube mounting brackets. Position the tube so that the joint in the polyethylene MOUNTING RING is centered at the bottom, near the chassis.
   FOR RECTANGULAR TUBES: Slip the neck of the tube through the RUBBER COLLAR, DEFLECTION YOKE, and FOCUS COIL. Seat the RUBBER STRIP on the two front mounting brackets. Be sure that the face of the tube rests against the rubber stop pads and not against the brackets for these pads.

3. FOR ROUND TUBES: Place the MOUNTING STRAP in the polyethylene MOUNTING RING groove and tighten the take-up screws on each end of the MOUNTING STRAP.
   FOR RECTANGULAR TUBES: Place the MOUNTING STRAP around the RUBBER STRIP and tighten the take-up screws on each end of the MOUNTING STRAP.

4. Move the REAR SUPPORT so that the RUBBER COLLAR rests firmly against and supports the cone of the tube. Tighten the REAR SUPPORT ADJUSTMENT SCREWS.

5. Check the ION TRAP for any marking and slip the trap over the neck of the tube. If the trap is stamped with an arrow, the arrow should point towards the face of the tube.

6. Connect the PICTURE TUBE SOCKET and the ANODE PLUG (PL-104).

7. Turn the receiver on and allow a few minutes for warm-up.

8 Turn up the BRIGHTNESS control and set the ION TRAP for maximum raster brilliance, backing off the BRIGHTNESS control as the maximum point is approached. The ION TRAP must be rotated about the axis of the tube as well as shifted along the neck to obtain the proper setting. With the BRIGHTNESS control set for slightly above normal brilliance and the CONTRAST control full counterclockwise, adjust the FOCUS control until the lines of the raster are clearly visible. Readjust the BRIGHTNESS control for normal brightness and touch up the ION TRAP setting.

9. Connect the antenna and tune in a test pattern.

10. Readjust the CONTRAST control until the different shades of the gray scale are clearly visible on the test pattern.

11. Check the position and appearance of the test pattern. If it is off center or shadowed at the corners (electron beam striking the neck of the tube) adjust the CENTERING LEVER. Set the FOCUS control at the center of its range and adjust the FOCUS COIL INDUCTANCE RING as necessary so that a clear sharp picture may be obtained well within the range of the FOCUS control.

CAUTION - It will not be necessary to move the CENTERING lever excessively in any direction. Excessive force on the CENTERING LEVER may snap the neck of the tube.

12. If the lines of the raster are not horizontal or square with respect to the escutcheon, loosen the DEFLECTION YOKE ADJ. thumb screw and rotate the DEFLECTION YOKE until the proper raster position is obtained. After the adjustment has been completed, tighten the thumb screw.

13. Follow the procedure under "SERVICE ADJUSTMENTS" and make any minor adjustment of the FOCUS COIL or DEFLECTION YOKE necessary to obtain the desired result.

## PICTURE TUBE ANODE HIGH VOLTAGE MEASUREMENT

The second anode potential will be approximately 12,500 volts in a receiver that is functioning properly. If it is possible to obtain good picture brilliance, the second anode potential is correct and need not be measured.

The setting of the HORIZONTAL DRIVE control will affect the high voltage on the second anode. Instructions for setting this control are given on page 5, opposite Fig. 7.

If it becomes necessary to measure the voltage present on the second anode, a meter specifically designed for high voltage measurements should be used. The CONTRAST and BRIGHTNESS controls should be rotated to the extreme counterclockwise position and PL-104 should be connected to the picture tube. Under these conditions the test meter will load the high voltage power supply approximately the same amount as the picture tube would during normal operation. The additional high voltage filter capacitor, built into a rectangular picture tube, will be in the circuit when PL-104 is connected. Sufficient filtering has also been provided in the high voltage supply circuit for proper operation when a round, metal cone picture tube is used.

## CAUTION-HIGH VOLTAGE

DO NOT USE HAND HELD FLEXIBLE TEST LEADS WHEN MAKING SECOND ANODE HIGH VOLTAGE MEASUREMENTS. AN 11 TO 14 KV POTENTIAL EXISTS IN THIS CIRCUIT. ANY ACCIDENTAL CONTACT WITH SUCH A HIGH VOLTAGE CAN BE SEVERELY INJURIOUS, AND MAY BE FATAL.

## HORIZONTAL OSCILLATOR ADJUSTMENT

If the HORIZONTAL HOLD control on the front panel fails to restore synchronization, the HORIZONTAL RANGE and HORIZONTAL LOCK adjustments should be reset. Procedure for these adjustments is as follows:

1. Turn the HOLD control to the full clockwise position. Adjust the HORIZONTAL RANGE adjustment until a vertical bar appears in the pattern.
2. Turn the HOLD control to the full counterclockwise position. Momentarily set the CHANNEL SELECTOR to a vacant channel position. Three or four horizontal bars should then appear on the screen. If too many or too few bars appear, the number may be decreased by turning the HORIZONTAL LOCK adjustment in the clockwise direction or increased by turning the HORIZONTAL LOCK adjustment in the counterclockwise direction.
3. Repeat step 1.

4. Check the action of the front controls on all active channels. Repeat the first three steps if necessary, to maintain stable synchronization.

If the above procedure fails to restore stable synchronization, make proper horizontal oscillator waveform adjustments with the aid of an oscilloscope.

5. Connect the oscilloscope as shown in Fig. 12. Adjust the TERTIARY WAVEFORM adjustment until the sine wave is equal in amplitude to the peak of the sawtooth. See Fig. 13. Vary the HORIZONTAL RANGE adjustment to keep the picture synchronized.

This adjustment is very important for correct operation of the circuit. If the broad peak of the wave on the oscilloscope is lower than the sharp one, the noise immunity becomes poorer, the stabilizing effect of the tuned circuit is reduced and drift of the oscillator becomes more serious.

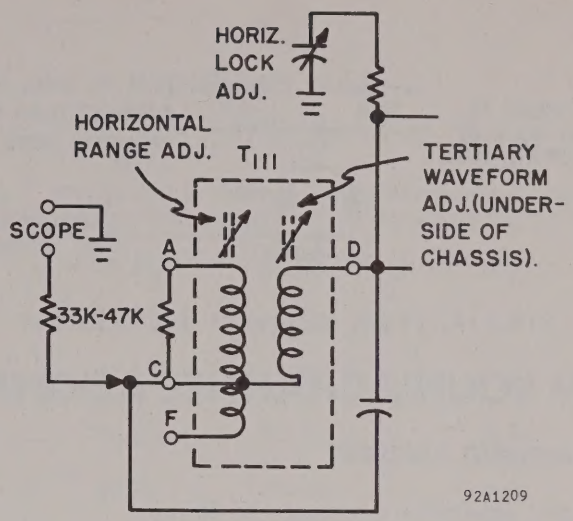



FIG. 12. OSCILLOSCOPE CONNECTION FOR HORIZONTAL OSCILLATOR ALIGNMENT

On the other hand, if the broad peak is higher than the sharp one, the oscillator is overstabilized, the pull-in range becomes inadequate and the broad peak can cause double triggering of the oscillator when the HOLD control approaches the clockwise position.

6. Remove the oscilloscope and repeat steps 1 and 2 if necessary.

7. Check the action of the front panel controls and repeat above steps as required to provide positive synchronization on all active channels.

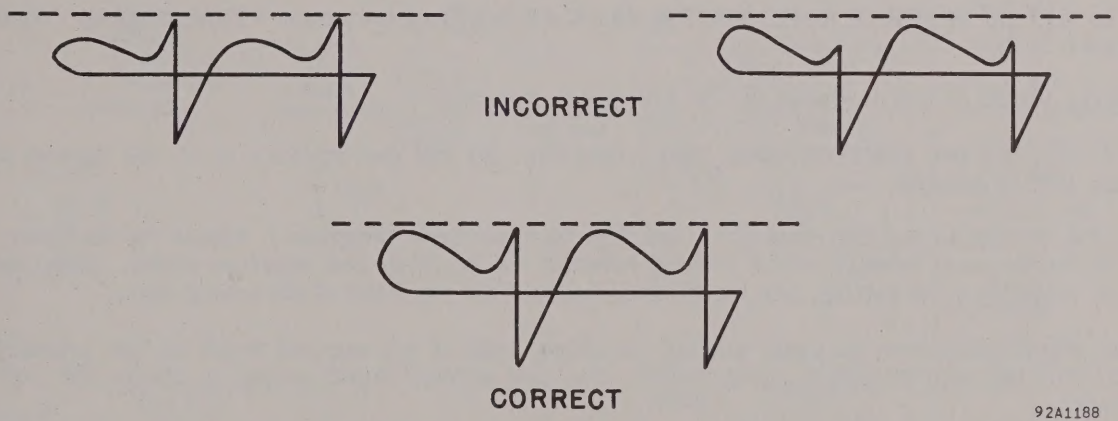



FIG. 13. HORIZONTAL OSCILLATOR WAVEFORMS

# AM TUNER ALIGNMENT

Connect a VTVM across R-215 at the terminal strip on the underside of the chassis as shown in Fig. 14 and Ⓔ on either schematic. Set the SELECTOR SWITCH to the AM position. Follow the steps in the chart below using just enough signal generator output to give a useful indication on the VTVM (approximately 2 volts). Refer to Figs. 16 and 26.

| Step | Sig. Gen. Connection (Hot Lead) Cold Lead to Chassis | Signal Generator Frequency (AM Modulated 30%) | Radio Dial Setting | Adjust | Procedure |
|---|---|---|---|---|---|
| 1 | Through .01 mfd. capacitor to pin 7 of the 6BE6 converter tube | 455 kc | 1000 kc | F,G,H,J | Adjust for a maximum VTVM reading. |
| 2 | Through .01 mfd. capacitor to stator of C-202A | 455 kc | 1000 kc | C-207 | Adjust for a minimum VTVM reading. |
| 3 | Through 200 mmf. capacitor to loop antenna primary | 1600 kc | 1600 kc | C-201B C-201A | Adjust for a maximum VTVM reading. |

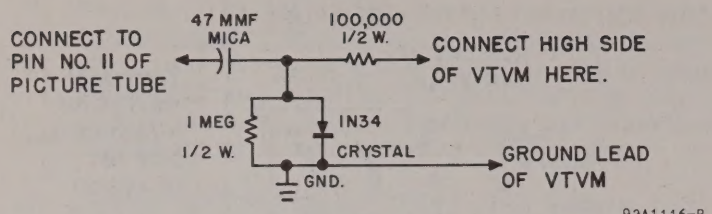



FIG. 14. SOUND ALIGNMENT TEST CIRCUIT

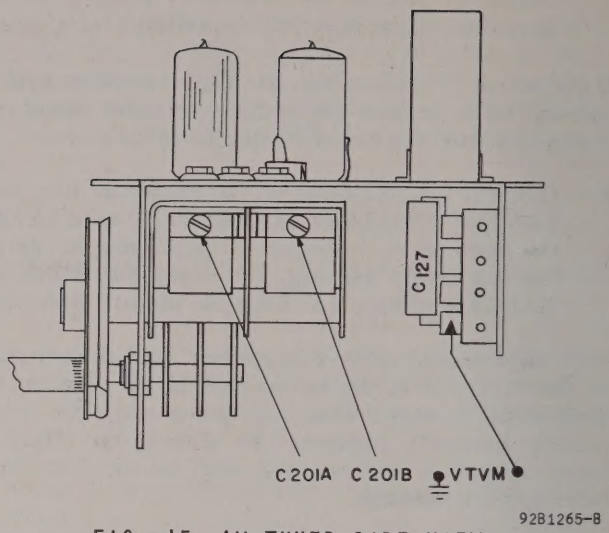



FIG. 15. AM TUNER SIDE VIEW

# FM SOUND CHANNEL ALIGNMENT

## EQUIPMENT REQUIRED

Signal generator covering 4 to 30 mc.
Vacuum tube voltmeter (VTVM)
1N34 crystal detector circuit as shown in Fig. 14

## PROCEDURE

1. Connect the signal generator output, through a .005 mfd. capacitor, to test terminal Ⓐ. (See Figs. 16 and 28). Ground the shield of the generator output cable to the chassis, near terminal Ⓐ.

2. Connect the detector circuit and VTVM as shown in Fig. 14. Adjust the generator output (unmodulated) to give a 1 volt reading on the VTVM.

3. Adjust L-104, 4.5 MC TRAP ADJ., (see Fig. 16) at 4.5 mc for a minimum VTVM reading. Disconnect the test circuit.

4. Connect the VTVM to test terminal Ⓑ (V-110, pin 2, Fig. 28).

5. Adjust L-105, 4.5 MC LIMITER GRID ADJ., (see Fig. 16) and the primary of T-108 (bottom core) for a maximum VTVM reading.

6. Connect the VTVM to test terminal Ⓒ. (See Fig. 28, Schematic Diagram.) Adjust the secondary of T-108 (top core) for the zero reading which occurs between the positive and negative peaks. If the zero reading occurs at more than one setting, use the position nearest the top limit of the tuning core.

7. Shift the signal generator an equal amount on either side of 4.5 mc and touch up the primary of T-108 (bottom core) for approximately equal peaks. Use just enough signal output to obtain one volt peaks for best results.

8. Disconnect the test equipment and tune in a test pattern. Adjust L-104 for maximum vertical wedge definition.

### TELEVISION CHANNELS vs CARRIER, OSCILLATOR AND I-F FREQUENCIES

| Channel No. | Channel Freq. (mc) | Picture Carrier Freq. (mc) | Sound Carrier Freq. (mc) | Receiver Osc. Freq. (mc) | Picture I-F Freq. (mc) | Sound I-F Freq. (mc) | Picture I-F less Sound I-F (mc) |
|---|---|---|---|---|---|---|---|
| 2 | 54-60 | 55.25 | 59.75 | 81.5 | 26.25 | 21.75 | 4.5 |
| 3 | 60-66 | 61.25 | 65.75 | 87.5 | 26.25 | 21.75 | 4.5 |
| 4 | 66-72 | 67.25 | 71.75 | 93.5 | 26.25 | 21.75 | 4.5 |
| 5 | 76-82 | 77.25 | 81.75 | 103.5 | 26.25 | 21.75 | 4.5 |
| 6 | 82-88 | 83.25 | 87.75 | 109.5 | 26.25 | 21.75 | 4.5 |
| 7 | 174-180 | 175.25 | 179.75 | 201.5 | 26.25 | 21.75 | 4.5 |

## TELEVISION CHANNELS vs CARRIER, OSCILLATOR AND I-F FREQUENCIES (Cont.)

| Channel No. | Channel Freq. (mc) | Picture Carrier Freq. (mc) | Sound Carrier Freq. (mc) | Receiver Osc. Freq. (mc) | Picture IF Freq. (mc) | Sound IF Freq. (mc) | Picture IF less Sound IF (mc) |
|---|---|---|---|---|---|---|---|
| 8 | 180-186 | 181.25 | 185.75 | 207.5 | 26.25 | 21.75 | 4.5 |
| 9 | 186-192 | 187.25 | 191.75 | 213.5 | 26.25 | 21.75 | 4.5 |
| 10 | 192-198 | 193.25 | 197.75 | 219.5 | 26.25 | 21.75 | 4.5 |
| 11 | 198-204 | 199.25 | 203.75 | 225.5 | 26.25 | 21.75 | 4.5 |
| 12 | 204-210 | 205.25 | 209.75 | 231.5 | 26.25 | 21.75 | 4.5 |
| 13 | 210-216 | 211.25 | 215.75 | 237.5 | 26.25 | 21.75 | 4.5 |

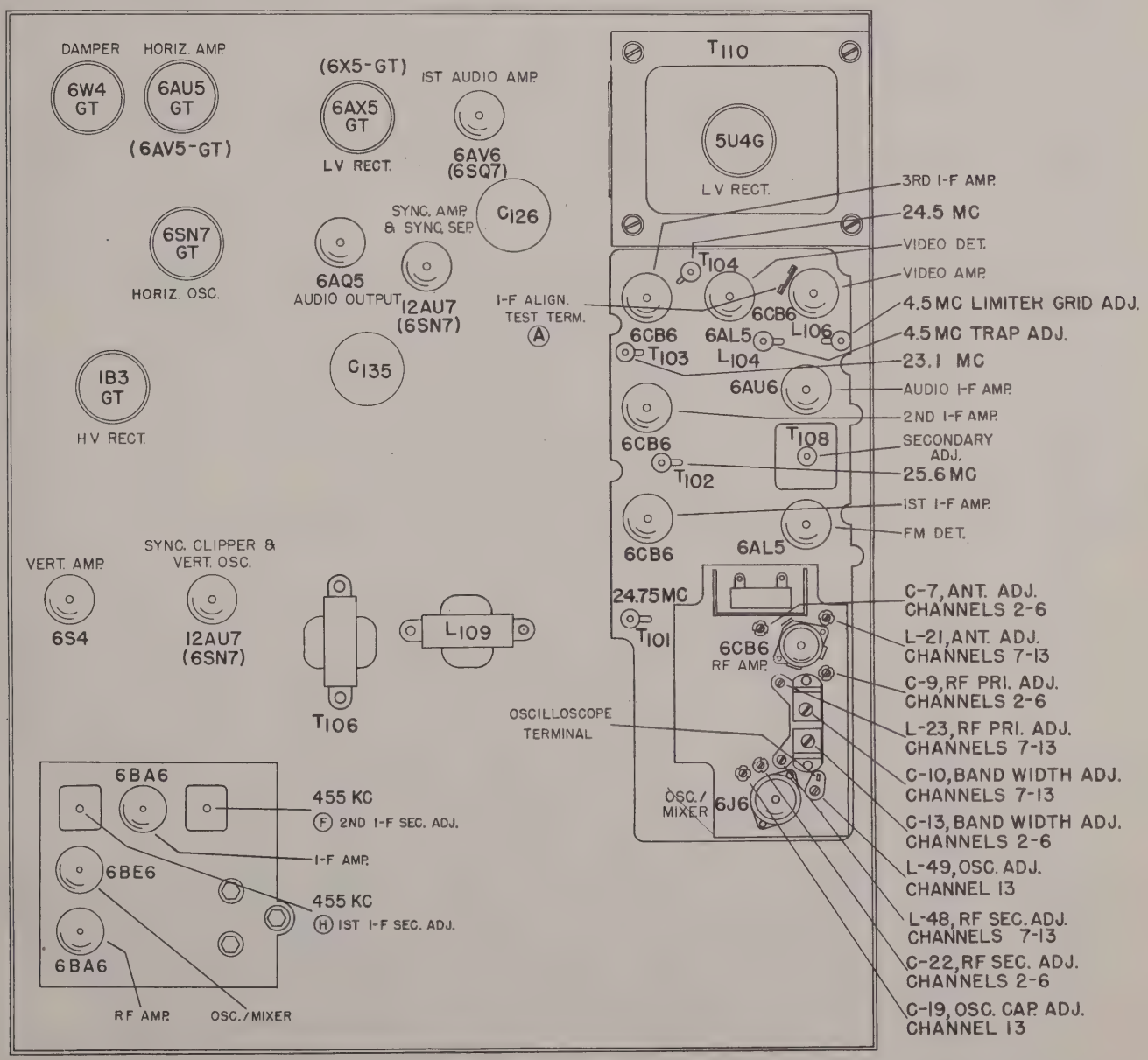



FIG. 16. TOP VIEW ALIGNMENT LOCATIONS

92D1178-L
92A1182-A

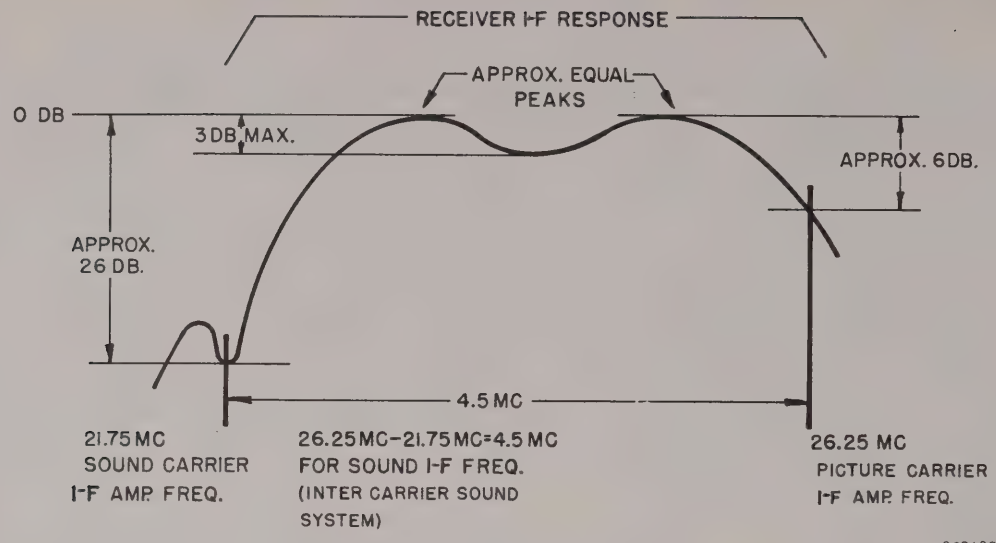



FIG. 17. I-F AMPLIFIER RESPONSE

## I-F AMPLIFIER ALIGNMENT

1. Connect a VTVM to test terminal (A). (See Fig. 16.)

2. Connect the high side of a signal generator to the shield of the OSC./MIXER tube (6J6). This connection will capacitively couple the generator output to the tube. Make sure that the shield is ungrounded by raising it above the grounded clips that hold it in place. Connect the ground return of the generator to any chassis point near the base of the tube.

3. Set the CHANNEL SELECTOR to any vacant channel.

4. Set the signal generator output (unmodulated) for a two volt dc reading on the VTVM and adjust the four i-f transformers, according to the I-F AMPLIFIER ALIGNMENT CHART shown below. Readjust the signal generator output as required to maintain the two volt potential at the VTVM.

5. After adjusting the 21.75 mc sound trap (bottom slug of T-103), recheck the setting of the top slug of T-103.

### I-F AMPLIFIER ALIGNMENT CHART

| Signal Generator Frequency (No Modulation) | Adjustment | Location | VTVM Indication |
|---|---|---|---|
| 24.75 mc | *T-101 (top) | Fig. 24 | Maximum |
| 24.75 mc | *T-101 (bottom) | Fig. 25 | Maximum |
| 25.6 mc | T-102 (top) | Fig. 24 | Maximum |
| 23.1 mc | T-103 (top) | Fig. 24 | Maximum |
| 24.5 mc | T-104 (top) | Fig. 24 | Maximum |
| 21.75 mc | T-103 (bottom) | Fig. 25 | Minimum |

*NOTE: The 1st i-f amplifier transformer (T-101) has two iron cores and must be adjusted from both top and bottom for a 24.75 mc response. Since this is an overcoupled transformer with a broad response, it will be necessary to connect a 1,000 ohm resistor across the primary winding (at the tuner terminals) when tuning the secondary (bottom slug) and then connect the same resistor across the secondary winding when adjusting the primary (top slug).

6. Tune the signal generator from 21 mc through 26.25 mc and observe the change in indication on the VTVM. If the generator output is set to the level where a 1.5 volt meter reading is obtained at the peak i-f amplifier response, the reading should not drop below one volt between the two peaks normally obtained with this i-f amplifier. If the band-pass response is unsatisfactory, repeat the procedure or try slight modifications of the recommended settings to obtain the desired results. Avoid resonating the coils with the iron core at the bottom end of the coil form. (Adjustment screw near limit of its travel). Final adjustments can be made much more easily if a sweep type signal generator and oscilloscope are available.

7. Check the two carrier i-f responses, 21.75 mc and 26.25 mc. The 21.75 mc response will be approximately 20 db below the peak response (approx. 0.15 volt) and the 26.25 mc response will fall approximately 6 db below the peak, (approx 0.75 volt). Refer to Fig. 17.

To determine the i-f amplifier sensitivity, connect a signal generator to the OSC./MIXER tube as directed in step 2 of the I-F AMPLIFIER ALIGNMENT procedure. Set the generator frequency to either i-f peak. If a generator output of 800 to 1500 microvolts produces a one volt dc reading on a VTVM connected between terminal Ⓐ and ground, the i-f amplifier sensitivity is normal.

# TV TUNER ALIGNMENT

The tuner, employing printed circuit coils, is of the turret type and covers channels 2 through 13. Its construction permits ease of adjustment and part replacement. It has been carefully aligned at the factory by personnel using precision equipment. Minor alignment adjustments of the tuner may be necessary after making tube or part replacement. For those service engineers who are properly equipped as specified, the following alignment procedure is included:

## EQUIPMENT REQUIRED

1. Sweep Generator -- RCA WR-59A or equivalent.
2. Marker Generator -- RCA WR-39A Television Calibrator or equivalent
3. Oscilloscope -- RCA WO-60C or equivalent
4. Vacuum Tube Voltmeter (VTVM) -- RCA WV-97A Senior Voltohmyst or equivalent.
5. Crystal Diode Circuit as shown in Fig. 18

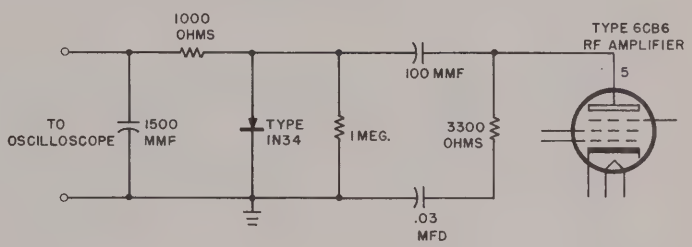



FIG. 18. CRYSTAL DIODE CIRCUIT

## SET-UP PROCEDURE

1. Connect all test equipment and the television receiver chassis to a common ground.
2. Connect the test circuit as shown in Fig. 18.
3. Apply a fixed bias to the tuner by connecting the positive pole of a 1.5 volt flashlight cell to the receiver chassis, and connecting the negative pole to terminal #1 of the tuner. (See Fig. 28 for tuner terminal identification.)
4. Rotate C-10 and C-13 clockwise (fully in). See Fig. 16.

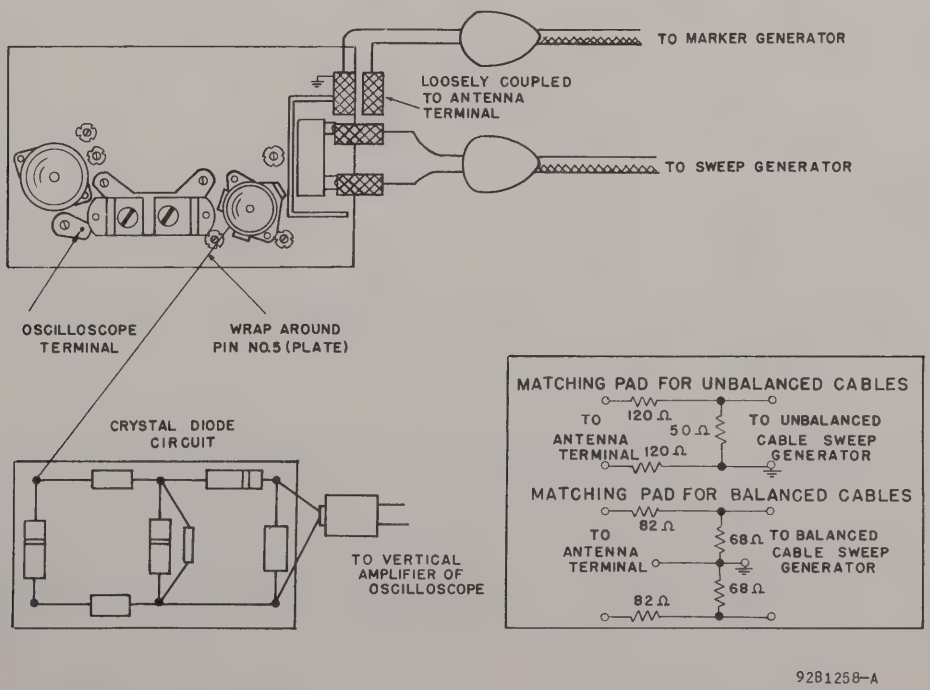



FIG. 19. TV TUNER ALIGNMENT TEST EQUIPMENT CONNECTIONS

## TV ANTENNA CIRCUIT ALIGNMENT

Refer to Figure 16 for location of all adjustments in this section and chart on pages 10 and 11.

5. Set test equipment and tuner to channel 6 (82-88 mc).

6. Adjust C-7 for required response curve on the oscilloscope (Fig. 20A). Peak in center with marker pips down equally on either side of curve.

7. Tune test equipment and tuner to channel 7 (174-180 mc).

8. Adjust L-21 for required response curve on the oscilloscope (Fig. 20B). Peak in center with marker pips down equally on either side of curve.

9. If L-21 requires a large adjustment, repeat steps 5 through 8 until the required response curves are obtained.

10. Check the response curves on channels 2, 3, 4, 5 and 6 and readjust C-7 for a compromise response curve for each channel. If the curves are more similar to 20C than they are to 20D, adjust C-7 counterclockwise. If the curves are more similar to 20D than they are to 20C, adjust C-7 clockwise. Curves for each of the channels 2 through 6 should be similar to Fig. 20A, although alignment is complete if some curves are similar to Fig. 20C, and some curves are similar to Fig. 20D. Adjustment is necessary only if all curves resemble Fig. 20C or Fig. 20D, rather than a compromise between them.

11. Check the response curves on channels 7, 8, 9, 10, 11, 12 and 13 and readjust L-21 for a compromise response curve for each channel. If the curves are more similar to Fig. 20E than they are to Fig. 20F, adjust L-21 clockwise. If the curves are more similar to Fig. 20F than they are to Fig. 20E, adjust L-21 counterclockwise. Curves for each of these channels should appear similar to that of Fig. 20B, although this portion of the alignment is complete if some curves are similar to Fig. 20E and some curves are similar to Fig. 20F. Adjustment is necessary only if all curves resemble Fig. 20E or Fig. 20F rather than a compromise between them.

12. Remove the crystal diode circuit and connect the oscilloscope directly to the OSCILLOSCOPE TERMINAL.

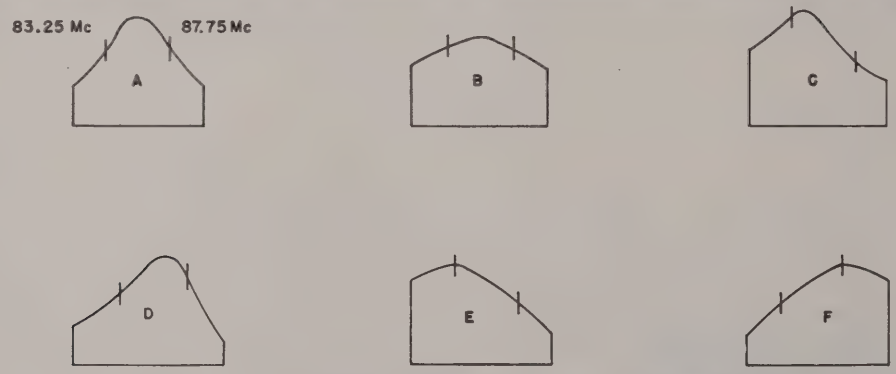



FIG. 20. TV TUNER ANTENNA CIRCUIT ALIGNMENT CURVES 92B1169

## TV RF ALIGNMENT

Refer to Figure 16 for location of all adjustments in this section and chart on pages 10 and 11.

13. Set tuner and test equipment to channel 6 (82-88 mc).

14. Adjust C-9, C-13 and C-22 to obtain a response curve on the oscilloscope similar to that shown on the normal curve in Fig. 21. This may be accomplished in the following manner:

    a. Rotate C-13 counterclockwise approximately one-half turn.

    b. Refer to Fig. 21 to determine the effects of tuning C-9, C-13 and C-22. C-9 primarily controls the center frequency of the response curve. C-22 primarily controls tilt of the curve, and C-13 its bandwidth.

    c. It may be necessary to readjust C-22 after adjusting C-13.

15. Set tuner and test equipment to channel 12 (204-210 mc).

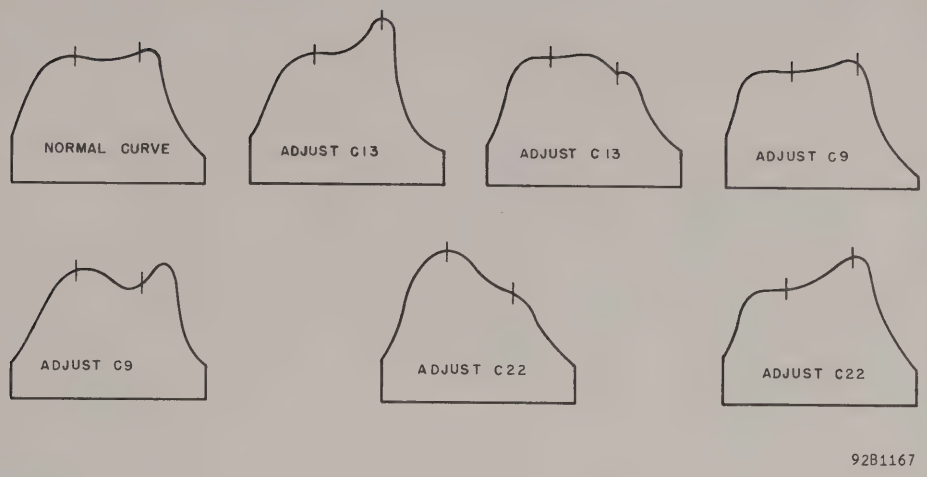



FIG. 21. TV TUNER RF CIRCUIT ALIGNMENT CURVES, CHANNELS 2-6

16. Adjust C-10, L-23 and L-48 to obtain a response curve on the oscilloscope similar to that shown as the normal curve in Fig. 22. This may be accomplished in the following manner:

    a. Rotate C-10 counterclockwise approximately one-half turn.

    b. Refer to Fig. 22 to determine the effects of tuning C-10, L-23 and L-48. L-23 primarily controls the center frequency of the response curve. L-48 primarily controls tilt of the curve and C-10 its bandwidth.

    c. It may be necessary to readjust L-48 after adjusting C-10.

17. Check the response curve for each channel, 2 through 6. Compromise adjustments on C-9, C-13 and C-22 may be necessary to obtain response curves similar to those shown in Fig. 23, for each channel.

    C-9 and C-22 have an effect on the response of channels 7 through 13. It may be necessary to include adjustment of these capacitors in the alignment of those channels. This should be done ONLY if two or more curves on the high channels slant in opposite directions. Care must be exercised so that the curve of channels 2 through 6 will not be thrown far out of line. A recheck of channels 2 through 6 may be necessary.

18. Check the response curve for each channel, 7 through 13. Compromise adjustments on C-10, L-23 and L-48 may be necessary to obtain response curves similar to those shown in Fig. 23, for each channel.

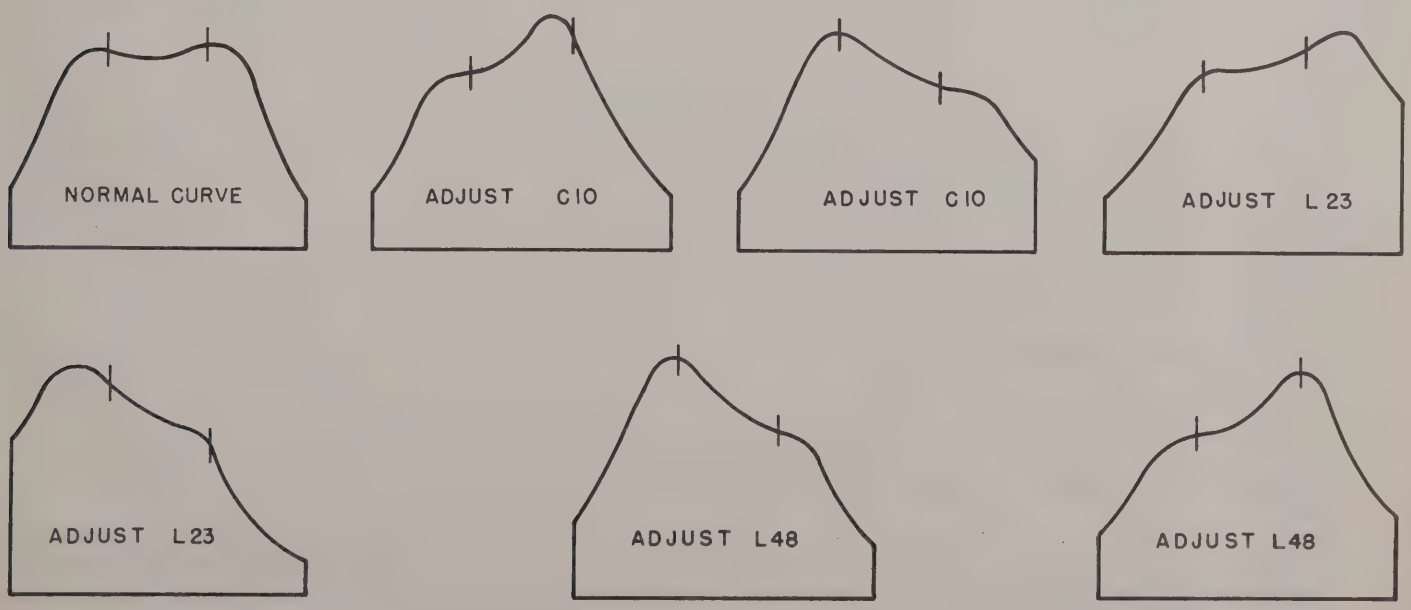



FIG. 22. TV TUNER RF CIRCUIT ALIGNMENT CURVES, CHANNELS 7-13

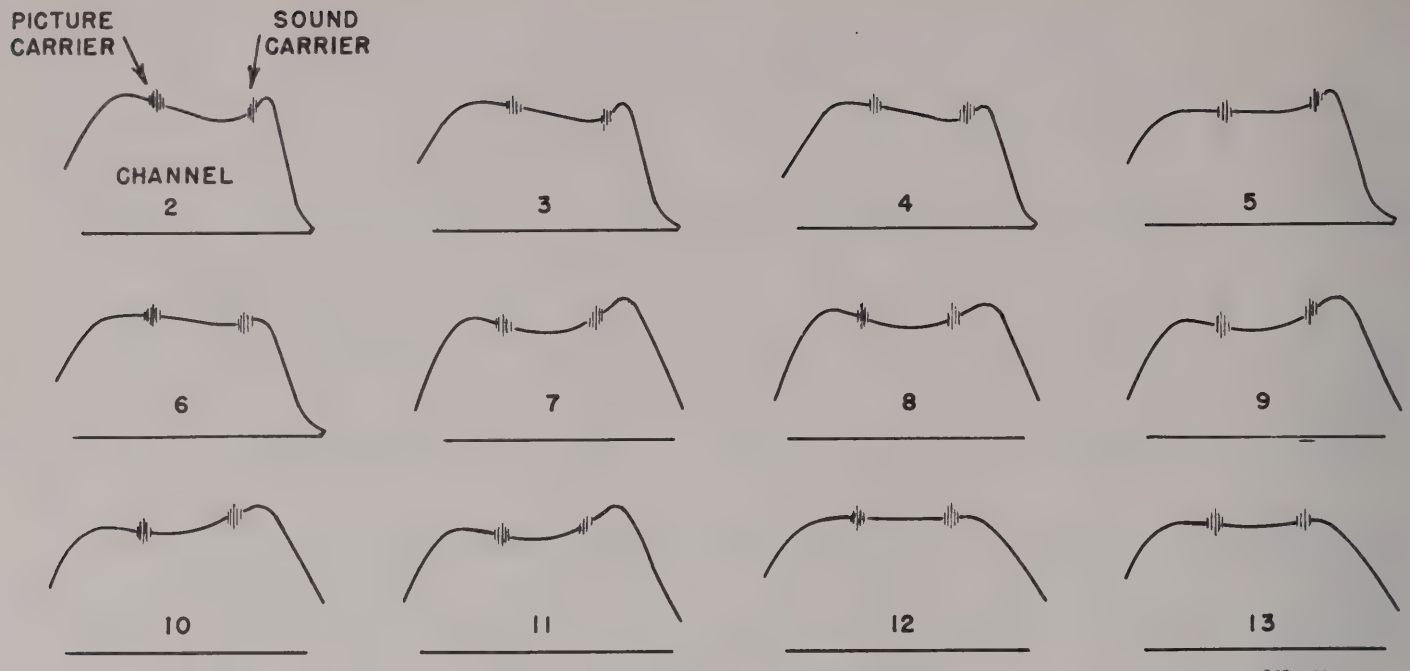



FIG. 23. TV TUNER CHANNEL RESPONSE CURVES

9281166

# TV OSCILLATOR ALIGNMENT

## EQUIPMENT REQUIRED

1. Sweep Generator covering the 54-88 mc and 174-216 mc range, with a sweep width of 0-10 mc
2. Marker Generator covering all sound carriers as shown in chart on pages 10 and 11
3. Marker Generator covering the sound intermediate frequency of 21.75 mc
4. Oscilloscope

## SET-UP PROCEDURE

1. Connect the vertical input of the oscilloscope to terminal 5 of the tuner by means of the crystal diode circuit shown in Fig. 18.
2. Connect the sweep generator and the rf marker generator to the antenna terminals.
3. Connect the i-f marker generator to the vertical input of the oscilloscope.
4. Set the sweep width as necessary to give a good response curve.
5. Set the rf marker generator to the exact sound carrier frequency of the channel to which the receiver is tuned. (Start with channel 13).
6. Set the i-f marker generator to 21.75 mc.
7. Set the FINE TUNING control to mid-range.
8. Adjust trimmer capacitor C-19 until the pips from the i-f and rf markers, as seen on the oscilloscope, coincide. These pips should separate as the FINE TUNING control is rotated.
9. Set the rf marker generator to exactly the sound carrier of each channel and adjust each oscillator inductance for coinciding marker pips on the oscilloscope. If any one channel has insufficient range, with individual oscillator adjustment, readjust C-19 to effect proper adjustment of this channel and then readjust all other individual adjustments (L-36 through L-47) for coinciding marker pips.
10. Recheck the rf response curves of Figs. 20 and 21.

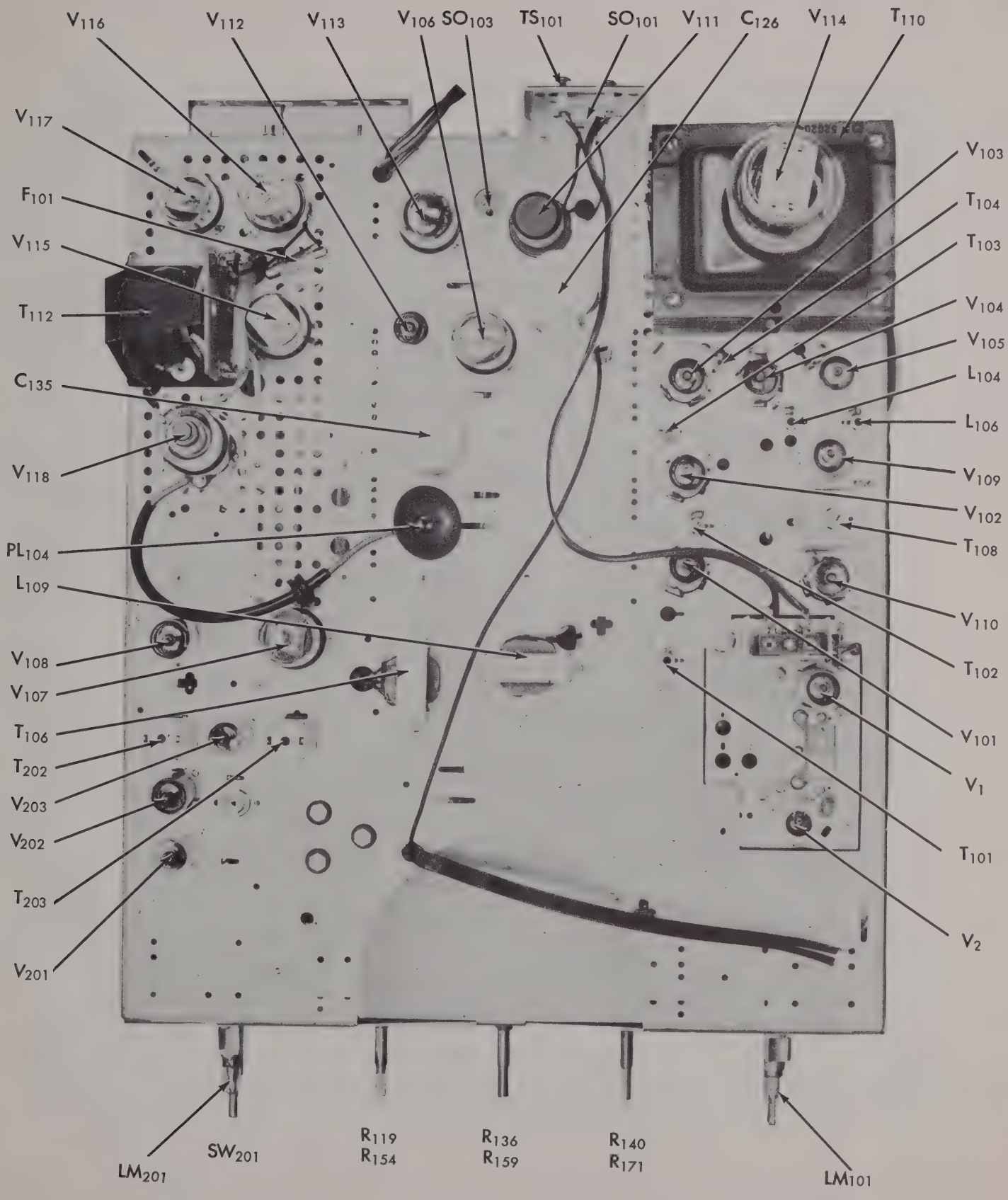
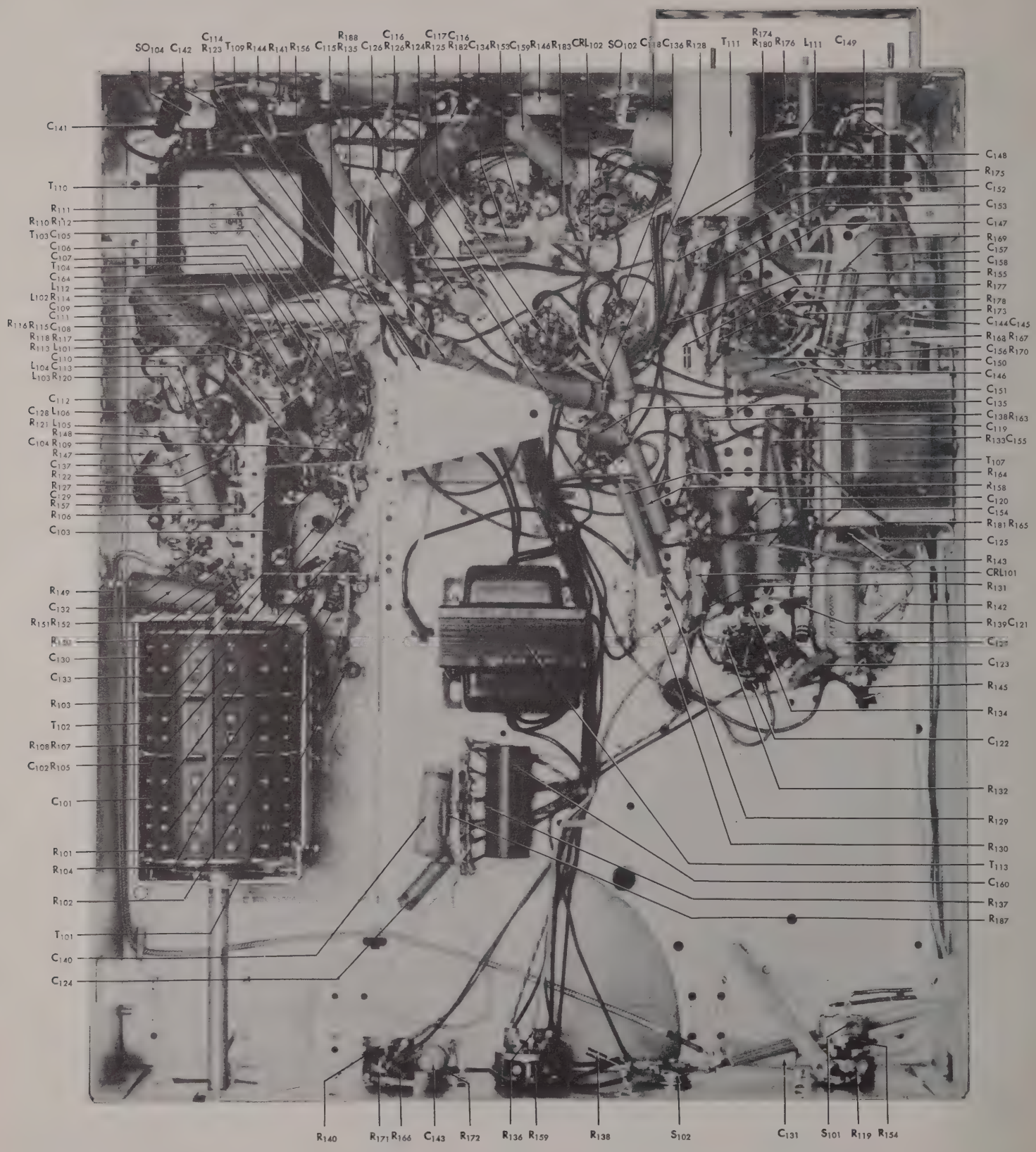



FIG. 24. TOP CHASSIS VIEW, COMPONENT LOCATION
(Plug PL-104 is for rectangular picture tube in above illustration.)




92X1333

FIG. 25. BOTTOM CHASSIS VIEW, COMPONENT LOCATION

(Chassis illustrated above uses alternate power supply, AM Tuner not shown. Refer to Fig. 26, page 19.)

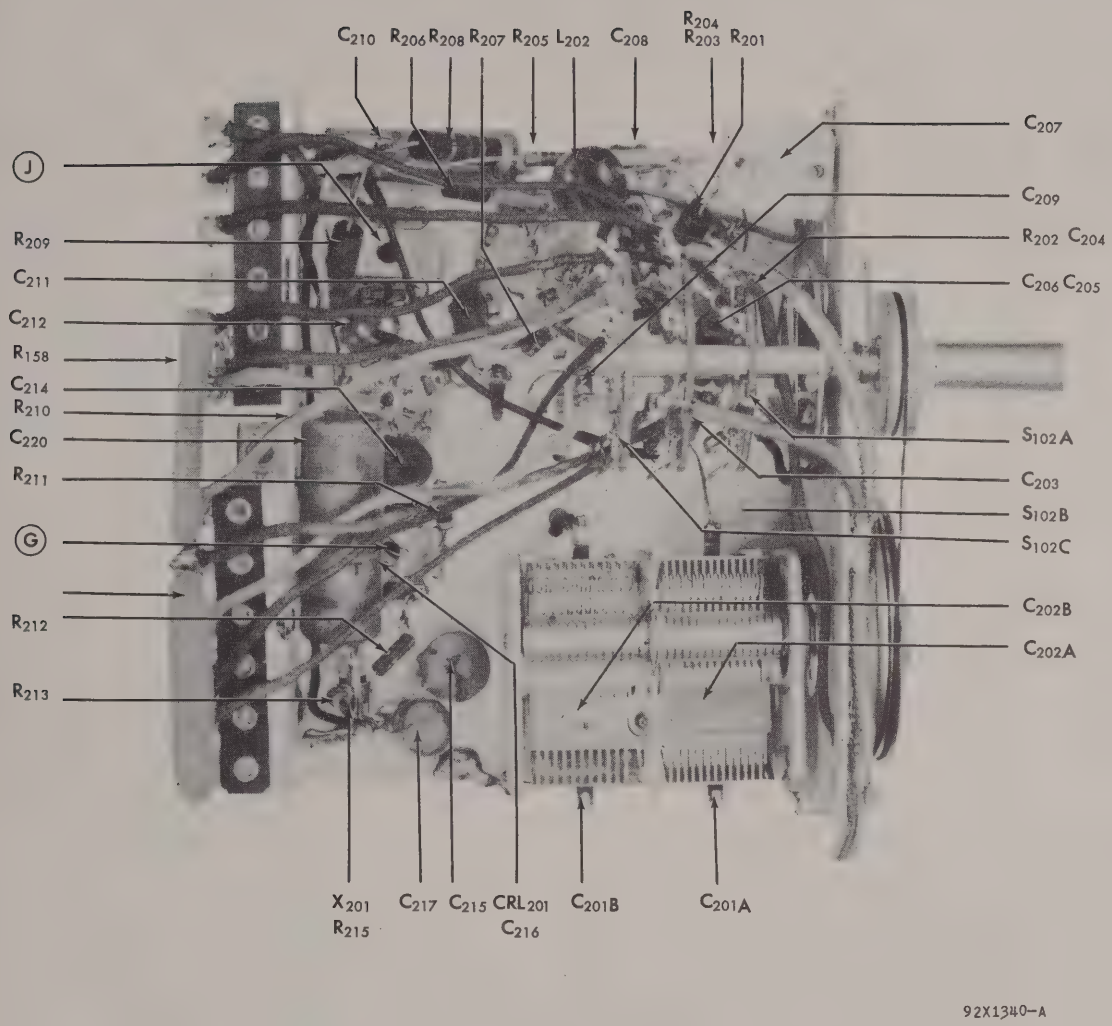



FIG. 26. BOTTOM VIEW COMPONENT LOCATION (AM TUNER)

# AM TUNER DIAL STRINGING INSTRUCTIONS

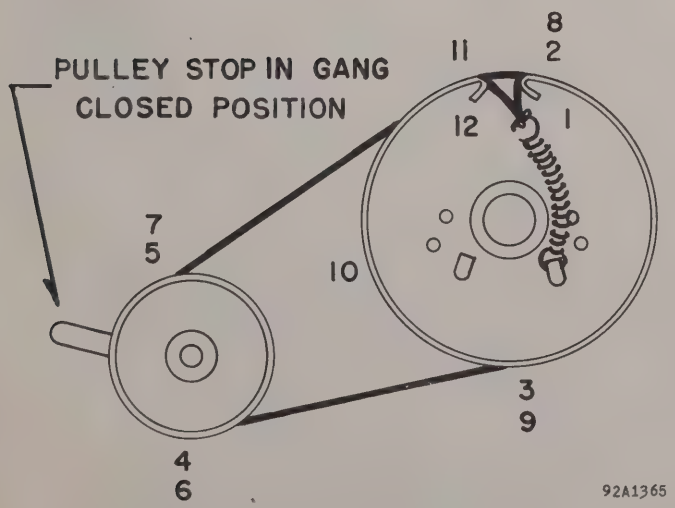



FIG. 27. DIAL STRINGING DETAIL (AM TUNER)

Use a 30 inch length of 30 lb. test dial cord. Tie one end of the dial cord to the tension spring; stretch the spring and follow the stringing sequence shown in Fig. 27. Position of pulleys with capacitor plates fully closed is also shown in this figure.

Check the action of the drive system. Increase the spring tension if the string slips or decrease the tension if the system binds.

Cut off loose ends of the dial cord and place a drop of quick drying cement on the knots.

# SERVICE PARTS LIST

REFER TO PAGE 22 FOR AM TUNER PARTS

| Schematic Symbol | Description | Hallicrafters' Part Number |
|---|---|---|
| | **CABINET PARTS** | |
| | Antenna, silver vortex; built-in | 57C147 |
| | Bracket, power indicator lamp (models 20990, 20990S, 20994) | 67A765 |
| | Cabinet (model 811) | 78F541 |
| | Cabinet (model 818) | 78F636 |
| | Cabinet (model 820) | 78F539 |
| | Cabinet (model 821) | 78F540 |
| | Cabinet (model 860) | 78F549 |
| | Cabinet (model 861) | 78F550 |
| | Cabinet (model 20990) | 78F559 |
| | Cabinet (model 20990S) | 78F586 |
| | Cabinet (model 20994) | 78F558 |
| | Cabinet back (model 811) | 8E1153 |
| | Cabinet back (model 818) | 8E1151 |
| | Cabinet back (models 820, 821) | 8E1154 |
| | Cabinet back (models 860, 861) | 8E1165 |
| | Cabinet back (models 20990, 20990S 20994) | 8F1239 |
| | Escutcheon assem., front controls | 7D205 |
| | Escutcheon, picture tube; metal (models 818, 820, 821, 860 & 861) | 7D196 |
| | Escutcheon, picture tube; metal (models 20990, 20990S, 20994) | 7D211 |
| | Glass, safety (model 811) | 22D288 |
| | Glass, safety (models 818, 820, 821, 860 & 861) | 22D292 |
| | Glass, safety (models 20990, 20990S, 20994) | 22D309 |
| | Jewel, power indicator; amber (models 20990, 20990S, 20994) | 86A057 |
| | Knob, AM TUNER (models 811, 818, 820, 860, 20990S & 20994) | 15B271 |
| | Knob, AM TUNER (models 821, 861 20990) | 15A279 |
| | Knob, AM-TV-PHONO (models 811, 818, 820, 860, 20990S & 20994) | 15C295 |
| | Knob, AM-TV-PHONO (models 821, 861, 20990) | 15A296 |
| | Knob, CHANNEL SELECTOR (models 811, 818, 820, 860, 20990S & 20994) | 15D293 |
| | Knob, CHANNEL SELECTOR (models 821, 861, 20990) | 15A294 |
| | Knob, CONTRAST, FOCUS, and HORIZONTAL HOLD control (models 811, 818, 820, 860, 20990S & 20994) | 15B269 |
| | Knob, CONTRAST, FOCUS, and HORIZONTAL HOLD control (models 821, 861, 20990) | 15A276 |
| | Knob, FINE TUNING (models 811, 818, 820, 860, 20990S & 20994) | 15A299 |
| | Knob, FINE TUNING ( models 821, 861, 20990) | 15A300 |
| | Knob, OFF-VOLUME, BRIGHTNESS and VERTICAL HOLD control (models 811, 818, 820, 860, 20990S & 20994) | 15B234 |
| | Knob, OFF-VOLUME, BRIGHTNESS and VERTICAL HOLD control (models 821, 861, 20990) | 15A243 |
| PL-101 | Line Cord and plug PL-102 | 87B1668 |
| | Mask, picture tube (model 811) | 7D166 |
| | Mask, picture tube (model 818) | 7D215 |
| | Mask, picture tube (models 820, 821, 860 & 861) | 7D197 |
| | Mask, picture tube (models 20990, 20990S, 20994) | 7D218 |
| | Pad, record changer (models 860, 861, 20990, 20990S & 20994) | 32A487 |
| PL-103 | Plug, speaker | 10A372 |
| | Retainer strip, safety glass (model 818) | 8B1203 |
| | Retainer strip, safety glass (models 820, 821, 860, 861, 20990, 20990S & 20994) | 63A420 |
| | Shield, picture tube socket; mounted on cabinet back (model 811) | 69A334 |
| | Shield, picture tube socket; mounted on cabinet back (models 20990, 20990S, & 20994) | 69A348 |
| | Shield, power indicator lamp (models 20990, 20990S, 20994) | 69A197 |
| LS-101 | Speaker, 5 inch (model 811) | 85C103 |
| LS-101 | Speaker, 8 inch (models 818, 820, 821) | 85C104 |
| LS-101 | Speaker, 12 inch (models 860, 861, 20990, 20990S & 20994) | 85D107 |
| | **CAPACITORS** | |
| C-101,102,103, 104,106,107, 121,163,164 | 5000 mmf. 450 V., ceramic | 47A168 |
| C-105,117 | 68 mmf. 500 V., ceramic | 47B20680K5 |
| C-108 | 10 mmf. 500 V., ceramic | 47B20100K5 |
| C-109,110 | .5 mfd. 25 V., tubular | 46A177 |
| C-111 | 100 mfd. 10 V., electrolytic | 45B170 |
| C-112 | 2.2 mmf. 500 V., ceramic | 47A160-4 |
| C-113,128 | 47 mmf. 500 V., ceramic (part of L-104 & L-106) | - - - - |
| C-114 | 220 mmf. 500 V., mica | 47X20B221K |
| C-115,116,143, 146,155 | .05 mfd. 600 V., tubular | 46AY503J |
| C-118 | Dual 10 mfd. 450 V., electrolytic | 45A172 |
| C-119 | 120 mmf. 500 V., mica | 47X20B121K |
| C-120,144 | .5 mfd. 200 V., tubular | 46AT504J |
| C-122,130 | 1000 mmf. 500 V., ceramic | 47B20A102M5 |
| C-123 | 6800 mmf. 500 V., mica | 47X35B682K |
| C-124,131,134, 136,138 | .01 mfd. 600 V., tubular | 46AY103J |
| C-125 | .047 mfd. 600 V., tubular | 46BR473L6 |
| C-126 | 60-40 mfd. 450 V., .75 mfd. 50 V., electrolytic | 45B173 |
| C-127,158,161 | .1 mfd. 600 V., tubular | 46AX104J |
| C-129 | Dual 4000 mmf. 450 V., ceramic | 47A218 |
| C-132,154 | 5 mfd. 50 V., electrolytic | 45B175 |
| C-133 | 330 mmf. 500 V., ceramic | 47B20331K5 |
| C-135 | 40-40 mfd. 250 V., 40 mfd. 450 V., 20 mfd. 25 V.; electrolytic | 45B174 |
| C-137 | .1 mfd. 200 V., tubular | 46AU104J |
| C-139 | 56 mmf. 500 V., mica | 47X20A560M |
| *C-141,142 | .01 mfd. 600 V., tubular | 46BR103J6 |
| C-145 | .02 mfd. 600 V., tubular | 46AY203J |
| C-147,156 | 330 mmf. 500 V., mica | 47X20B331K |
| *C-148 | .01 mfd. 400 V., tubular | 46BR103E4 |
| C-149 | Trimmer, HORIZONTAL LOCK control | 44A391 |
| C-150,151 | 82 mmf. 500 V., mica | 47X20B820K |
| C-152 | 820 mmf. 500 V., mica | 47X25B821K |
| C-153 | 4700 mmf. 500 V., mica | 47X35B472K |
| C-157,159 | .03 mfd. 600 V., tubular | 46AY303J |
| C-160 | 8 mfd. 475 V., electrolytic | 45A103 |
| C-162 | 500 mmf. 20,000 V., ceramic | 47A223 |
| C-166 | .05 mfd. 200 V., tubular | 46AU503J |
| CRL-101 | Vertical integrating network | 49A015 |
| CRL-102 | Audio coupling network | 49A017 |
| | **COILS AND TRANSFORMERS** | |
| L-101 | Coil, video peaking (wound on R-113) | 51A1256 |
| L-102 | Coil, video peaking (wound on R-114) | 51A1260 |
| L-103 | Coil, video peaking (wound on R-120) | 51A1257 |
| L-104;106 | 4.5 MC TRAP; LIMITER GRID. ADJ. | 50B474 |
| L-105 | Coil, video peaking (wound on R-121) | 51A1259 |
| L-107 | Coil, FOCUS | 51B1246 |
| L-108 | Deflection yoke (models 811, 820, 821, 860 & 861) | 53C201 |
| L-108 | Deflection yoke (models 818, 20990, 20990S & 20994) | 53C197 |
| L-109 | Choke, filter | 56C116 |
| L-110 | Coil, HORIZONTAL LINEARITY control | 51A1243 |

* Use exact replacement part only.

# SERVICE PARTS LIST - Cont.

| Schematic Symbol | Description | Hallicrafters' Part Number |
|---|---|---|
| | **COILS AND TRANSFORMERS (Cont.)** | |
| L-111 | Coil, WIDTH control | 51A1261 |
| L-112 | Choke, heater | 53A200 |
| T-101 | Transformer, 1st i-f amplifier | 50B471 |
| T-102 | Transformer, 2nd i-f amplifier | 50A475 |
| T-103 | Transformer, 3rd i-f amplifier | 50A476 |
| T-104 | Transformer, 4th i-f amplifier | 50A477 |
| T-106 | Transformer, vertical oscillator | 55C115 |
| T-107 | Transformer, vertical output | 55B151 |
| T-108 | Transformer, ratio detector | 50C473 |
| T-109 | Transformer, audio output | 55B150 |
| T-110 | Transformer, power | 52C204 |
| T-111 | Transformer, horizontal oscillator | 51B1242 |
| T-112 | Transformer, horizontal output (models 811, 820, 821, 860 & 861) | 55C152 |
| T-112 | Transformer, horizontal output (models 818, 20990, 20990S & 20994) | 55C149 |
| | **MISCELLANEOUS PARTS** | |
| | Adapter, 7 inch phonograph records (models 860, 861, 20990, 20990S & 20994) | 8A1246 |
| | Bracket, deflection yoke and focus coil mtg.; lower(models 811, 820 821, 860 & 861) | 67D1235 |
| | Bracket, deflection yoke and focus coil mtg.; lower (model 818) | 67D1247 |
| | Bracket, deflection yoke and focus coil mtg.; lower (models 20990, 20990S, & 20994) | 67D1249 |
| | Bracket, deflection yoke and focus coil mtg.; upper | 67D1348 |
| | Bracket, deflection yoke mtg. (mounted on 67D1348) | 67D1244 |
| | Bracket, deflection yoke support (mounted on L-108) | 67B1305 |
| | Bracket, focus coil mtg. (mounted on focus coil assembly mtg. plate) | 67C1251 |
| | Bracket, mounting; for TS-101 and SO-101 | 67C1258 |
| | Bracket, picture tube mtg.; front left (models 811, 820, 821, 860 & 861) | 67D1238 |
| | Bracket, picture tube mtg.; front left (model 818) | 67D1260 |
| | Bracket, picture tube mtg.; front left (models 20990, 20990S, & 20994) | 67C1299 |
| | Bracket, picture tube mtg.; front right (models 811, 820, 821, 860 & 861) | 67D1237 |
| | Bracket, picture tube mtg.; front right (model 818) | 67D1261 |
| | Bracket, picture tube mtg.; front right (models 20990, 20990S, 20994) | 67D1300 |
| | Bracket, dial lamp | 67B1286 |
| | Clamp, picture tube mtg. (models 811, 820, 821, 860 & 861) | 76B594 |
| | Clamp, picture tube mtg. (model 818) | 76B597 |
| | Clamp, picture tube mtg. (models 20990, 20990S, 20994) | 76A612 |
| | Collar, picture tube mtg.; rubber (mounted in front of deflection yoke) | 16C202 |
| | Cover, picture tube protective (for 16GP4) | 8D1129 |
| | Cushion, picture tube mtg.; sponge rubber (for 16RP4) | 16C163 |
| | Cushion, picture tube mtg.; sponge rubber (for 20CP4) | 16A209 |
| | Dial lamp socket assembly 86A096 or | 86B106 |
| F-101 | Fuse, 1/4 amp. 250 V. | 39A344 |
| | Insulating sleeve, picture tube (for 16GP4) | 8D1129 |
| | Ion trap | 21A101 |
| LM-101 | Lamp, dial; G.E. #47 | 39A004 |
| | Lever, centering control (model 811) | 74B343 |
| | Lever, centering control (model 818) | 74B352 |
| | Lever, centering control (models 820, 821, 860, 861, 20990, 20990S & 20994) | 74B354 |

| Schematic Symbol | Description | Hallicrafters' Part Number |
|---|---|---|
| | **MISCELLANEOUS PARTS (Cont.)** | |
| | Mounting ring, picture tube; plastic (for 16GP4) | 8C997 |
| | Pad, rubber; 2 (mounted under front rim of 16RP4 or 20CP4) | 16A203 |
| | Plate, focus coil assembly mtg. (mounted on 67D1348) | 67C1386 |
| PL-104 | Plug, 16GP4 anode (part of model 818 insulating sleeve) | - - - - |
| PL-104 | Plug, 16RP4 anode | 10A374 |
| PL-104 | Plug, 20CP4 anode | 10A377 |
| PL-105 | Plug, 9 prong (color adapter) | 10A299 |
| | Polyethylene anode lead, 22 inches | 87A1046 |
| | Record changer, 3 speed (models 860, 861, 20990, 20990S & 20994) | 115A034 |
| | Ring, centering (part of focus coil assembly mtg. plate) | 76B636 |
| | Rubber channel, 2 (mounted under front of 16GP4) | 16A204 |
| | Shell, plug (for PL-105) | 69A369 |
| | Shield, dial lamp | 69A343 |
| SO-101 | Socket, ac power | 10A286 |
| SO-105 | Socket, 9 pin (color adapter) | 6A370 |
| | Socket assembly, hv rectifier tube | 6A355 |
| SO-104 | Socket, phono motor power | 10A015 |
| | Socket, tube; miniature 7 pin | 6A340 |
| | Socket, tube; miniature 9 pin | 6A334 |
| | Socket, tube, miniature 9 pin; molded mica filled | 6A360 |
| | Socket, tube, octal; molded | 6B296 |
| | Socket, tube, octal; molded mica filled | 6A364 |
| SO-102 | Socket, phono input | 36A041 |
| SO-104 | Socket, phono motor power | 10A015 |
| | Socket, picture tube | 6B357 |
| SO-103 | Socket, speaker | 10A373 |
| | Spring, ground; 16RP4 or 20CP4 picture tube | 75B177 |
| TS-101 | Terminal strip, antenna | 88A020 |
| | **RESISTORS** | |
| R-101,134,163 | 4700 ohms 1/2 watt, carbon | 23X20X472K |
| R-102,108,110, 111 | 100 ohms 1/2 watt, carbon | 23X20X101K |
| R-103,106,112, 118,147 | 150 ohms 1/2 watt, carbon | 23X20X151K |
| R-104,107,180 | 47 ohms, 1/2 watt, carbon | 23X20X470M |
| R-105,174 | 12,000 ohms 1/2 watt, carbon | 23X20X123K |
| R-109,122,137 | 10,000 ohms 1/2 watt, carbon | 23X20X103K |
| R-113 | 6800 ohms 1/2 watt, carbon (part of L-101) | - - - - - - |
| R-114,121 | 2200 ohms 1/2 watt, carbon (part of L-102 and L-105) | - - - - - - |
| R-115,145 | 1 megohm 1/2 watt, carbon | 23X20X105M |
| R-116 | 3300 ohms 1/2 watt, carbon | 23X20X332K |
| R-117,123 | 220,000 ohms 1/2 watt, carbon | 23X20X224M |
| R-119,154 | 1 megohm/2500 ohms; OFF-ON-VOLUME/CONTRAST control | 25B898 |
| R-120 | 15,000 ohms 1/2 watt, carbon (part of L-103) | - - - - - - |
| R-124 | 2.2 megohms 1/2 watt, carbon | 23X20X225M |
| R-125 | 270,000 ohms 1/2 watt, carbon | 23X20X274M |
| R-126,132,138 | 47,000 ohms 1/2 watt, carbon | 23X20X473K |
| R-127 | 5600 ohms 2 watts, carbon | 23X40X562K |
| R-128 | 820,000 ohms 1/2 watt, carbon | 23X20X824M |
| R-129,131 | 2200 ohms 1/2 watt, carbon | 23X20X222K |
| R-130 | 6800 ohms 1/2 watt, carbon | 23X20X682K |
| R-133 | 15,000 ohms 2 watts, carbon | 23X40X153K |
| R-135 | 1500 ohms 1 watt, carbon | 23X30X152K |
| R-136,159 | 2500/50,000 ohms; FOCUS-BRIGHTNESS control | 25B895 |
| R-140,171 | 1 megohm/50,000 ohms; VERTICAL-HORIZONTAL HOLD control | 25B917 |
| R-141 | 5000 ohms; VERTICAL LINEARITY control | 25B712 |
| R-142,175 | 8200 ohms 1/2 watt, carbon | 23X20X822K |
| *R-143 | 1 megohm 1 watt, carbon | 23X30BF105M |

* Use exact replacement part only.

# SERVICE PARTS LIST - Cont.

| Schematic Symbol | Description | Hallicrafters' Part Number |
|---|---|---|
| | **RESISTORS (Cont.)** | |
| R-144 | 1000 ohms 1 watt, carbon | 23X30X102K |
| R-146 | 2.5 megohms; HEIGHT control | 25B711 |
| R-148 | 22,000 ohms 1/2 watt, carbon | 23X20X223K |
| R-149 | 270 ohms 1/2 watt, carbon | 23X20X271K |
| R-150 | 33,000 ohms 1/2 watt, carbon | 23X20X333K |
| *R-151,152 | 10,000 ohms 1/2 watt, carbon | 23X20X103J |
| R-153 | 10 megohms 1/2 watt, carbon | 23X20X106M |
| R-155 | 270 ohms 1 watt, carbon | 23X30X271K |
| R-156 | 15,000 ohms 10 watts, ww | 24A922 |
| R-157 | 100,000 ohms 1/2 watt, carbon | 23X20X104M |
| R-158 | 1000 ohms 5 watts, ww | 24A921 |
| R-160,162 | 560 ohms 1/2 watt, carbon (part of L-108) | - - - - - - |
| R-161 | 300 ohms 1/2 watt, carbon (part of L-108) | - - - - - - |
| R-164 | 750 ohms 10 watts, ww | 24A920 |
| R-165 | 3900 ohms 1/2 watt, carbon | 23X20X392K |
| *R-166 | 120,000 ohms 1 watt, carbon | 23X30BF124K |
| R-167,177 | 330,000 ohms 1/2 watt, carbon | 23X20X334K |
| R-168,191 | 820,000 ohms 1/2 watt, carbon | 23X20X824K |
| R-169 | 82,000 ohms 1 watt, carbon | 23X30X823K |
| *R-170 | 330,000 ohms 1 watt, carbon | 23X30BF334J |
| R-172 | 68,000 ohms 1/2 watt, carbon | 23X20X683K |
| R-173 | 150,000 ohms 1/2 watt, carbon | 23X20X154K |
| R-176 | 50,000 ohms; HORIZONTAL DRIVE control | 25A858 |
| *R-178 | 47,000 ohms 1 watt, carbon | 23X30BF473K |
| R-179 | 470,000 ohms 1/2 watt, carbon | 23X20X474M |
| *R-181 | 220 ohms 3 watts, ww | 24A925 |
| *R-182 | 200 ohms 5 watts, ww | 24A926 |
| R-183 | 2200 ohms 1 watt, carbon | 23X30X222K |
| R-184 | 3.3 ohms 1/2 watt, carbon | 23X20X033K |
| R-185 | 1 megohm 1 watt, carbon | 23X30X105M |
| R-186 | 150,000 ohms 1/2 watt, carbon | 23X20X154M |
| R-187 | 680 ohms 1/2 watt, carbon | 23X20X681M |
| | **TUBES** | |
| V-1 | 6CB6: rf amplifier; (part of tv tuner) | - - - - - - |
| V-2 | 6J6: oscillator/mixer (part of tv tuner) | - - - - - - |
| V-101,102,103; 105 | 6CB6: 1st, 2nd, and 3rd i-f amplifiers; video amplifier | 90X6CB6 |
| V-104;110 | 6AL5: video detector; fm detector | 90X6AL5 |
| V-106;107 | 12AU7: sync. amplifier and separator; sync. clipper and vertical oscillator or | 90X12AU7 |
| | 6SN7: same as above | 90X6SN7 |
| V-108 | 6S4: vertical amplifier | 90X6S4 |
| V-109 | 6AU6: audio i-f amplifier | 90X6AU6 |
| V-111 | 6AV6: audio amplifier or | 90X6AV6 |
| | 6SQ7: same as above | 90X6SQ7 |
| V-112 | 6AQ5: audio output | 90X6AQ5 |
| V-113 | 6AX5-GT: low voltage rectifier | 90X6AX5-GT |
| V-114 | 5U4G: low voltage rectifier | 90X5U4G |
| V-115 | 6SN7-GT: horizontal oscillator | 90X6SN7-GT |
| V-116 | 6AU5:horizontal amplifier or | 90X6AU5 |
| | 6AV5-GT: same as above | 90X6AV5-GT |
| V-117 | 6W4-GT: damper | 90X6W4-GT |
| V-118 | 1B3-GT: high voltage rectifier | 90X1B3-GT |
| V-119 | 16RP4: picture tube (models 811 820, 821, 860 & 861) | 90X16RP4 |
| V-119 | 16GP4: picture tube (model 818) | 90X16GP4 |
| V-119 | 20CP4: picture tube (models 20990, 20990S, 20994) | 90X20CP4 |

# AM TUNER PARTS LIST

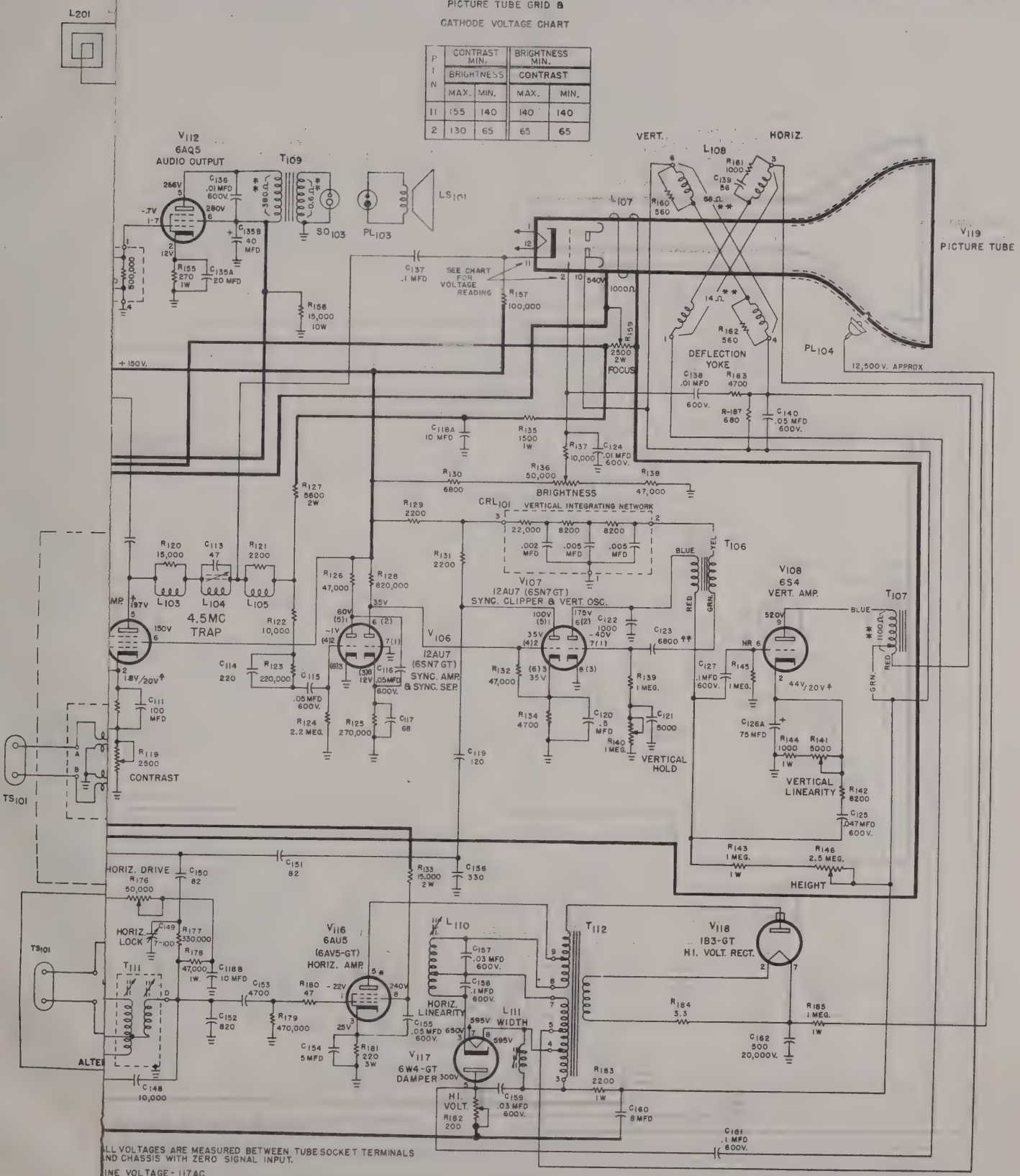
| Schematic Symbol | Description | Hallicrafters' Part Number |
|---|---|---|
| | **CAPACITORS** | |
| C-201A & B | Trimmers, adjustable (part of C-202) | - - - - - |
| C-202A & B | Tuning capacitor, 2 sections | 48C241 |
| C-203,208,212 | 270 mmf. 500 V., ceramic | 47B20A271K5 |
| C-204,205,206, 211,214,215 | 5000 mmf. 450 V., ceramic | 47A168 |
| C-207 | Trimmer, adjustable; 455 kc trap adj. | 44A392 |
| C-209 | 47 mmf. 500 V., ceramic | 47B20A470K5 |
| C-210 | .02 mfd. 600 V., tubular | 46AY203J |
| C-216 | 10 mmf. 500 V., ceramic | 47B20A100K5 |
| C-217 | .05 mfd. 200 V., tubular | 46AU503J |
| C-218,219 | 100 mmf. (part of CRL-201) | - - - - - |
| C-220 | .1 mfd. 600 V., tubular | 46AY104J |
| CRL-201 | Audio filter network | 49A016 |
| | **COILS AND TRANSFORMERS** | |
| L-201 | Antenna, loop | 57C146 |
| L-202 | Coil, 455 kc trap | 53A198 |
| T-201 | Coil, oscillator | 51A1245 |
| T-202,203 | Transformer, 455 kc input and output i-f | 50A472 |
| | **MISCELLANEOUS PARTS** | |
| SW-201 | Bandswitch assembly | 60B401 |
| | Bracket, dial lamp | 67A1286 |
| | Dial cord, 25 inch | 38A001 |
| | Dial lamp socket assembly | 86A096 |
| LM-201 | Lamp, dial; G.E. #47 | 39A004 |
| | Shield, dial lamp | 69A343 |
| | Socket, miniature 7 pin | 6A308 |
| | Spring, dial cord tension | 75A012 |
| | Spring, i-f transformer mounting | 76A385 |
| | **RESISTORS** | |
| R-201,209 | 2.2 megohms, 1/2 watt; carbon | 23X20X680K |
| R-202,205,212 | 1000 ohms, 1/2 watt, carbon | 23X20X102M |
| R-203,211 | 56,000 ohms, 1/2 watt; carbon | 23X20X563K |
| R-204 | 8200 ohms, 1/2 watt; carbon | 23X20X822M |
| R-206,213 | 1 megohm, 1/2 watt; carbon | 23X20X105M |
| R-207 | 22,000 ohms, 1/2 watt; carbon | 23X20X223K |
| R-208 | 27,000 ohms, 1 watt; carbon | 23X30X273K |
| R-210 | 2200 ohms, 1/2 watt; carbon | 23X20X222M |
| R-214 | 47,000 ohms, 1/2 watt; carbon (part of CRL-201) | ---------- |
| R-215 | 470,000 ohms, 1/2 watt; carbon | 23X20X424M |
| R-216 | 1000 ohms, 5 watts, ww | 24A921 |
| | **TUBES** | |
| V-201,203 | 6BA6: rf amp. and i-f amp. | 90X6BA6 |
| V-202 | 6BE6: oscillator/mixer | 90X6BE6 |
| X-201 | Crystal diode: detector (1N60) | 19A1246 |

* Use exact replacement part only.

# MODELS 811, 818, 820, 821, 860, 861, 20990, 20990S &20994

PICTURE TUBE GRID & CATHODE VOLTAGE CHART

| PIN | CONTRAST MIN. BRIGHTNESS MAX. | CONTRAST MIN. BRIGHTNESS MIN. | BRIGHTNESS MAX. CONTRAST MAX. | BRIGHTNESS MIN. CONTRAST MIN. |
|---|---|---|---|---|
| 11 | 155 | 140 | 140 | 140 |
| 2 | 130 | 65 | 65 | 65 |




ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS WITH ZERO SIGNAL INPUT.

LINE VOLTAGE - 117AC

ALL VOLTAGES ARE DC AND POSITIVE UNLESS OTHERWISE SPECIFIED.

DC VOLTAGES ARE MEASURED WITH A VTVM.

"R"-NOT READABLE. VOLTAGES MEASURED AT THESE TERMINALS GENERALLY MEANINGLESS.

ALL CONTROLS SET FOR NORMAL PICTURE OPERATION UNLESS OTHERWISE SPECIFIED.

FIG. 30. SCHEMATIC DIAGRAM FOR MODELS 89F390

FIG. 28. SCHEMATIC DIAGRAM FOR MODELS WITHOUT COLOR ATTACHMENT SOCKET AND ALTERNATE POWER SUPPLY

# SERVICE PARTS LIST - Cont.

| Schematic Symbol | Description | Hallicrafters' Part Number |
|---|---|---|
| | **RESISTORS (Cont.)** | |
| R-144 | 1000 ohms 1 watt, carbon | 23X30X102K |
| R-146 | 2.5 megohms; HEIGHT control | 25B711 |
| R-148 | 22,000 ohms 1/2 watt, carbon | 23X20X223K |
| R-149 | 270 ohms 1/2 watt, carbon | 23X20X271K |
| R-150 | 33,000 ohms 1/2 watt, carbon | 23X20X333K |
| *R-151,152 | 10,000 ohms 1/2 watt, carbon | 23X20X103J |
| R-153 | 10 megohms 1/2 watt, carbon | 23X20X106M |
| R-155 | 270 ohms 1 watt, carbon | 23X30X271K |
| R-156 | 15,000 ohms 10 watts, ww | 24A922 |
| R-157 | 100,000 ohms 1/2 watt, carbon | 23X20X104M |
| R-158 | 1000 ohms 5 watts, ww | 24A921 |
| R-160,162 | 560 ohms 1/2 watt, carbon (part of L-108) | - - - - - - |
| R-161 | 100 ohms 1/2 watt, carbon (part of L-108) | - - - - - - |
| R-164 | 750 ohms 10 watts, ww | 24A920 |
| R-165 | 3900 ohms 1/2 watt, carbon | 23X20X392K |
| *R-166 | 120,000 ohms 1 watt, carbon | 23X30BF124K |
| R-167,177 | 330,000 ohms 1/2 watt, carbon | 23X20X334K |
| R-168,191 | 820,000 ohms 1/2 watt, carbon | 23X20X824K |
| R-169 | 82,000 ohms 1 watt, carbon | 23X30X823K |
| *R-170 | 330,000 ohms 1 watt, carbon | 23X30BF334J |
| R-172 | 68,000 ohms 1/2 watt, carbon | 23X20X683K |
| R-173 | 150,000 ohms 1/2 watt, carbon | 23X20X154K |
| R-176 | 50,000 ohms; HORIZONTAL DRIVE control | 25A858 |
| *R-178 | 47,000 ohms 1 watt, carbon | 23X30BF473K |
| R-179 | 470,000 ohms 1/2 watt, carbon | 23X20X474M |
| *R-181 | 220 ohms 3 watts, ww | 24A925 |
| *R-182 | 200 ohms 5 watts, ww | 24A926 |
| R-183 | 2200 ohms 1 watt, carbon | 23X30X222K |
| R-184 | 3.3 ohms 1/2 watt, carbon | 23X20X033K |
| R-185 | 1 megohm 1 watt, carbon | 23X30X105M |
| R-186 | 150,000 ohms 1/2 watt, carbon | 23X20X154M |
| R-187 | 680 ohms 1/2 watt, carbon | 23X20X681M |
| | **TUBES** | |
| V-1 | 6CB6: rf amplifier; (part of tv tuner) | - - - - - - |
| V-2 | 6J6: oscillator/mixer (part of tv tuner) | - - - - - - |
| V-101,102,103; 105 | 6CB6: 1st, 2nd, and 3rd i-f amplifiers; video amplifier | 90X6CB6 |
| V-104;110 | 6AL5: video detector; fm detector | 90X6AL5 |
| V-106;107 | 12AU7: sync. amplifier and separator; sync. clipper and vertical oscillator or | 90X12AU7 |
| | 6SN7: same as above | 90X6SN7 |
| V-108 | 6S4: vertical amplifier | 90X6S4 |
| V-109 | 6AU6: audio i-f amplifier | 90X6AU6 |
| V-111 | 6AV6: audio amplifier or | 90X6AV6 |
| | 6SQ7: same as above | 90X6SQ7 |
| V-112 | 6AQ5: audio output | 90X6AQ5 |
| V-113 | 6AX5-GT: low voltage rectifier | 90X6AX5-GT |
| V-114 | 5U4G: low voltage rectifier | 90X5U4G |
| V-115 | 6SN7-GT: horizontal oscillator | 90X6SN7-GT |
| V-116 | 6AU5:horizontal amplifier or | 90X6AU5 |
| | 6AV5-GT: same as above | 90X6AV5-GT |
| V-117 | 6W4-GT: damper | 90X6W4-GT |
| V-118 | 1B3-GT: high voltage rectifier | 90X1B3-GT |
| V-119 | 16RP4: picture tube (models 811 820, 821, 860 & 861) | 90X16RP4 |
| V-119 | 16GP4: picture tube (model 818) | 90X16GP4 |
| V-119 | 20CP4: picture tube (models 20990, 20990S, 20994) | 90X20CP4 |

# AM TUNER PARTS LIST

| Schematic Symbol | Description | Hallicrafters' Part Number |
|---|---|---|
| | **CAPACITORS** | |
| C-201A & B | Trimmers, adjustable (part of C-202) | - - - - - |
| C-202A & B | Tuning capacitor, 2 sections | 48C241 |
| C-203,208,212 | 270 mmf. 500 V., ceramic | 47B20A271K5 |
| C-204,205,206, 211,214,215 | 5000 mmf. 450 V., ceramic | 47A168 |
| C-207 | Trimmer, adjustable; 455 kc trap adj. | 44A392 |
| C-209 | 47 mmf. 500 V., ceramic | 47B20A470K5 |
| C-210 | .02 mfd. 600 V., tubular | 46AY203J |
| C-216 | 10 mmf. 500 V., ceramic | 47B20A100K5 |
| C-217 | .05 mfd. 200 V., tubular | 46AU503J |
| C-218,219 | 100 mmf. (part of CRL-201) | - - - - - |
| C-220 | .1 mfd. 600 V., tubular | 46AY104J |
| CRL-201 | Audio filter network | 49A016 |
| | **COILS AND TRANSFORMERS** | |
| L-201 | Antenna, loop | 57C146 |
| L-202 | Coil, 455 kc trap | 53A198 |
| T-201 | Coil, oscillator | 51A1245 |
| T-202,203 | Transformer, 455 kc input and output i-f | 50A472 |
| | **MISCELLANEOUS PARTS** | |
| SW-201 | Bandswitch assembly | 60B401 |
| | Bracket, dial lamp | 67A1286 |
| | Dial cord, 25 inch | 38A001 |
| | Dial lamp socket assembly | 86A096 |
| LM-201 | Lamp, dial; G.E. #47 | 39A004 |
| | Shield, dial lamp | 69A343 |
| | Socket, miniature 7 pin | 6A308 |
| | Spring, dial cord tension | 75A012 |
| | Spring, i-f transformer mounting | 76A385 |
| | **RESISTORS** | |
| R-201,209 | 2.2 megohms, 1/2 watt; carbon | 23X20X680K |
| R-202,205,212 | 1000 ohms, 1/2 watt, carbon | 23X20X102M |
| R-203,211 | 56,000 ohms, 1/2 watt; carbon | 23X20X563K |
| R-204 | 8200 ohms, 1/2 watt; carbon | 23X20X822M |
| R-206,213 | 1 megohm, 1/2 watt; carbon | 23X20X105M |
| R-207 | 22,000 ohms, 1/2 watt; carbon | 23X20X223K |
| R-208 | 27,000 ohms, 1 watt; carbon | 23X30X273K |
| R-210 | 2200 ohms, 1/2 watt; carbon | 23X20X222M |
| R-214 | 47,000 ohms, 1/2 watt; carbon (part of CRL-201) | ---------- |
| R-215 | 470,000 ohms, 1/2 watt; carbon | 23X20X424M |
| R-216 | 1000 ohms, 5 watts, ww | 24A921 |
| | **TUBES** | |
| V-201,203 | 6BA6: rf amp. and i-f amp. | 90X6BA6 |
| V-202 | 6BE6: oscillator/mixer | 90X6BE6 |
| X-201 | Crystal diode: detector (1N60) | 19A1246 |

* Use exact replacement part only.

# MODELS 811, 818, 820, 821, 860, 861, 20990, 20990S &20994

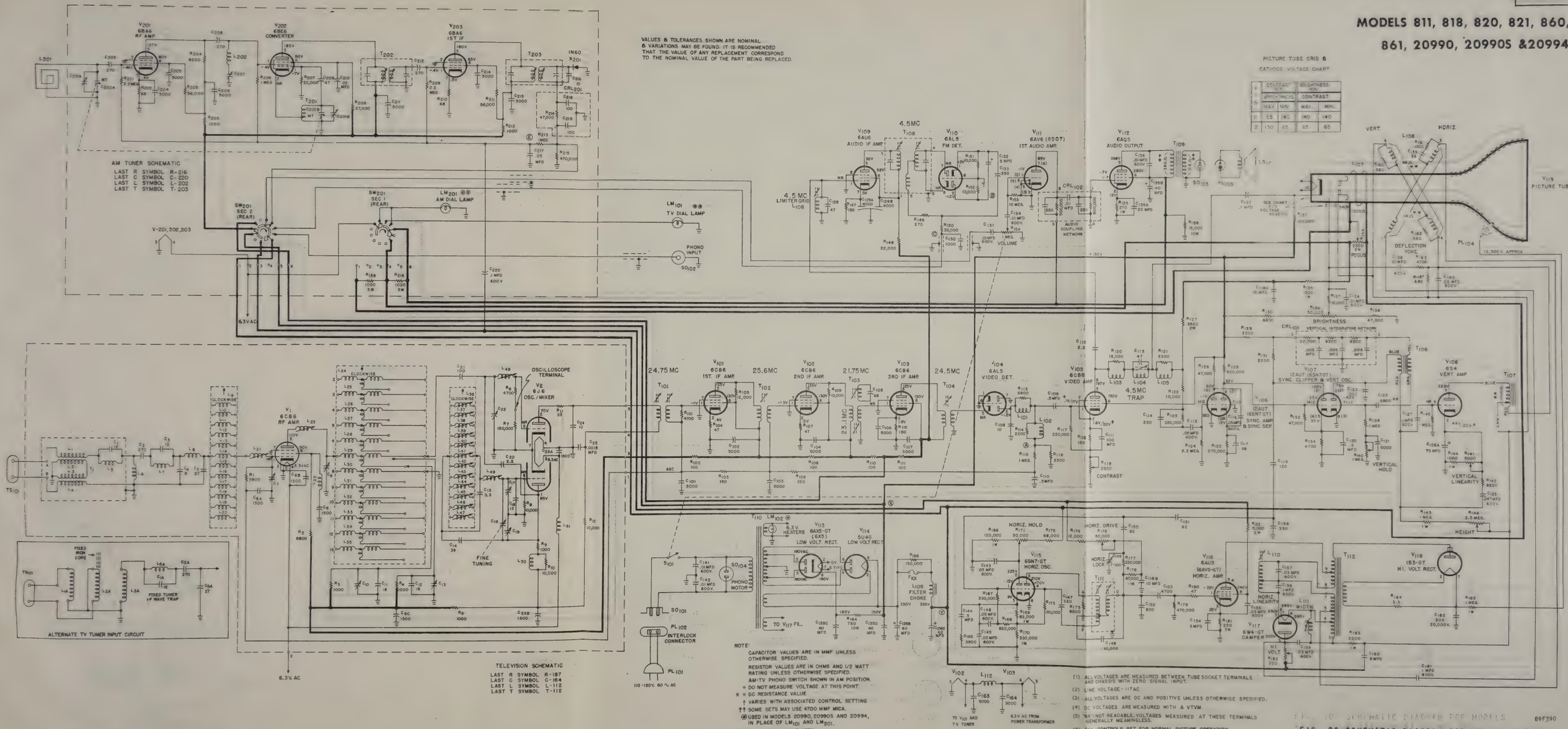
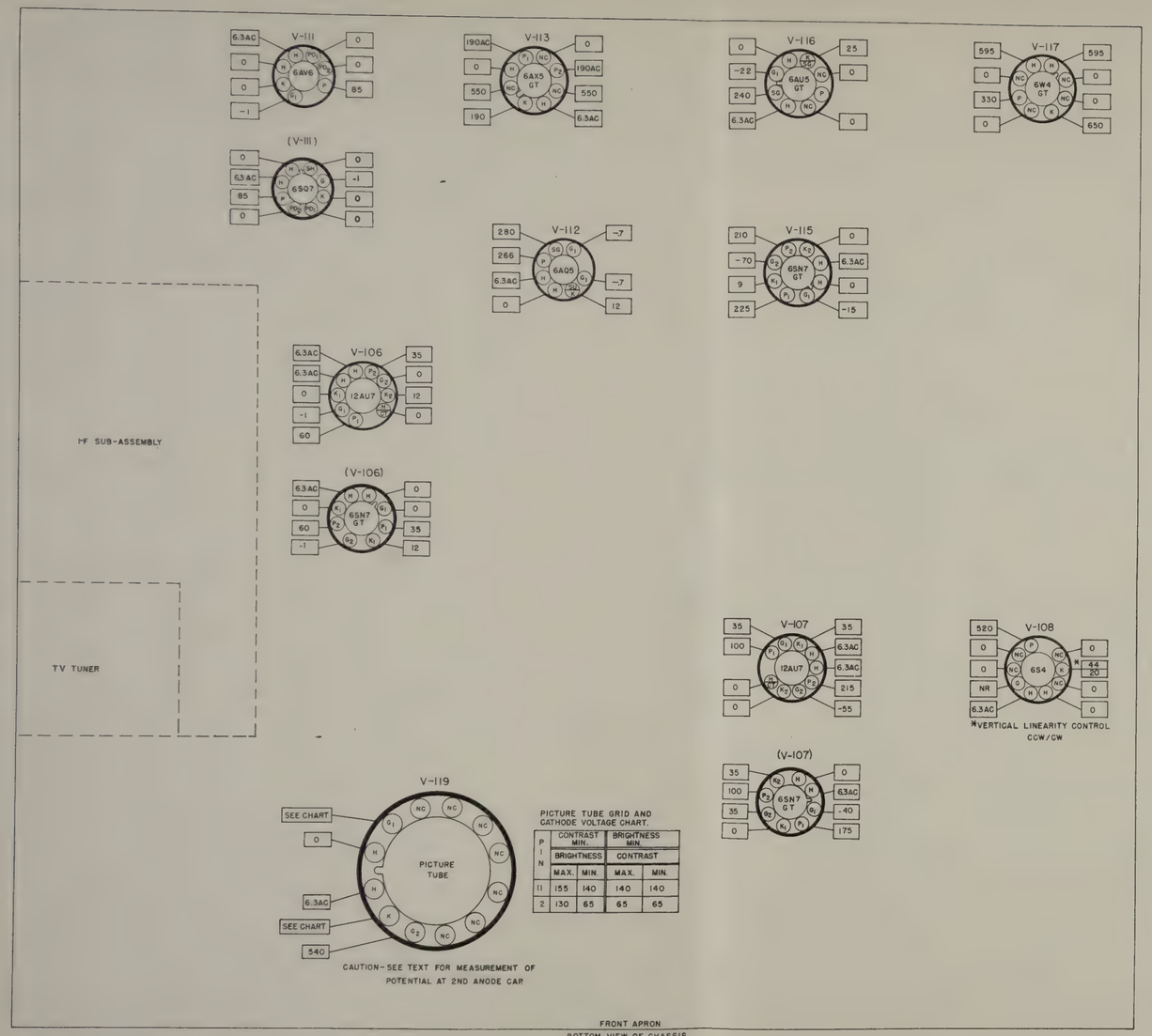



FIG. 28. SCHEMATIC DIAGRAM FOR MODELS WITHOUT COLOR ATTACHMENT SOCKET AND ALTERNATE POWER SUPPLY

89F390




PICTURE TUBE GRID AND CATHODE VOLTAGE CHART.

| PIN | CONTRAST MIN. | | BRIGHTNESS MIN. | |
|---|---|---|---|---|
| | BRIGHTNESS | | CONTRAST | |
| | MAX. | MIN. | MAX. | MIN. |
| 1 | 155 | 140 | 140 | 140 |
| 2 | 130 | 65 | 65 | 65 |

NOTES— 1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS & CHASSIS WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE—117 V. AC.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES WERE MEASURED WITH A VTVM.
6. "NC"-NO CONNECTION. VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG.
7. "NR"- NOT READABLE. VOLTAGES MEASURED AT THESE TERMINALS GENERALLY MEANINGLESS.
8. ALL VOLTAGES ON PICTURE TUBE WERE TAKEN AT TIE POINTS OF TUBE SOCKET LEADS.
9. CONTROLS SET FOR NORMAL PICTURE UNLESS OTHERWISE SPECIFIED.
10. SERVICE ADJUSTMENTS MADE FOR NORMAL OPERATION.
11. MEASURMENT OF 2ND ANODE POTENTIAL AT PICTURE TUBE AS EXPLAINED IN TEXT IS RECOMMENDED FOR CHECK ON 1B3 RECTIFIER.

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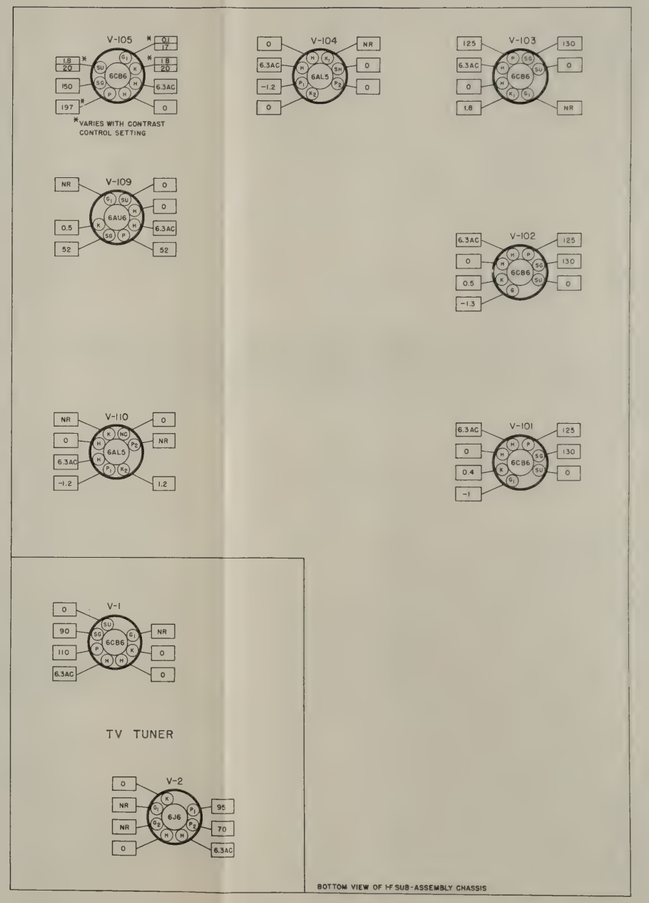
FIG. 29A. VOLTAGE CHART FOR MAIN TV CHASSIS




92D1186-B

FIG. 29B. VOLTAGE CHART FOR I-F SUB-ASSEMBLY

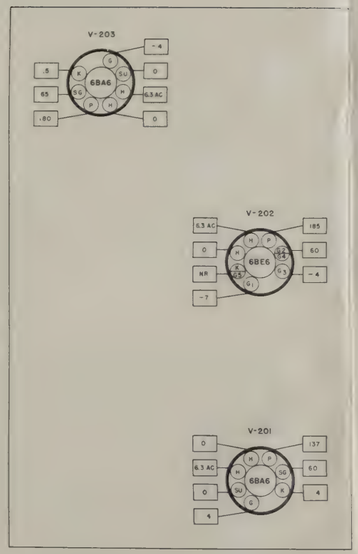



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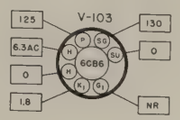
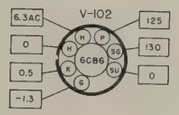
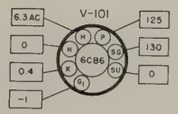
FIG. 29C. VOLTAGE CHART FOR AM TUNER SUB-ASSEMBLY




BOTTOM VIEW OF I-F SUB-ASSEMBLY CHASSIS

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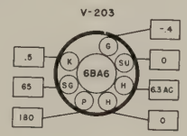
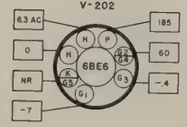
VOLTAGE CHART FOR I-F SUB-ASSEMBLY



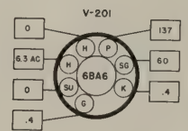




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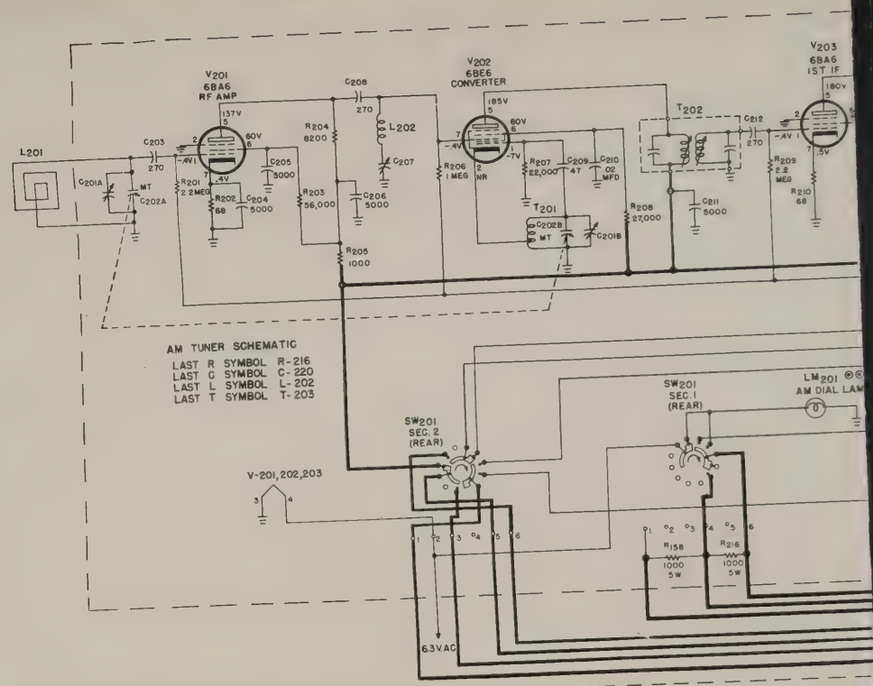
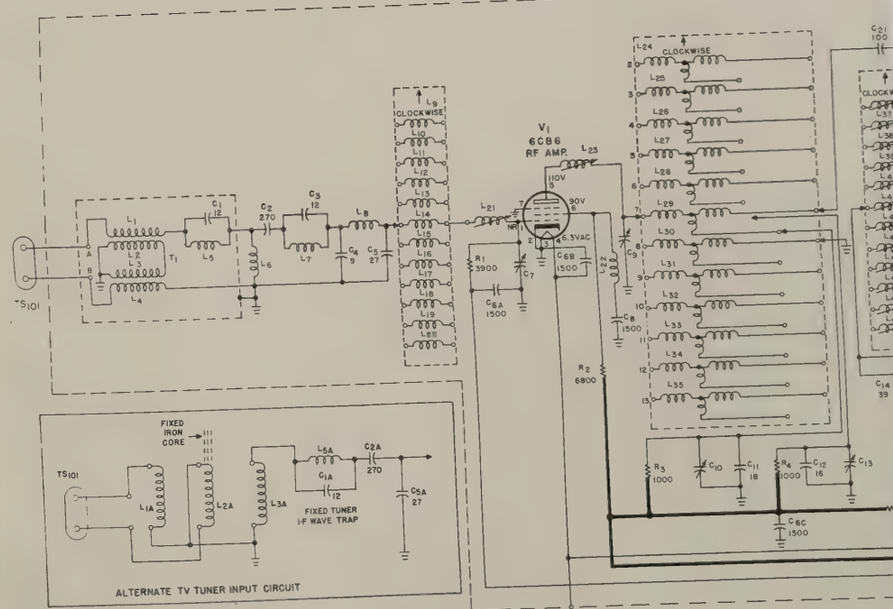
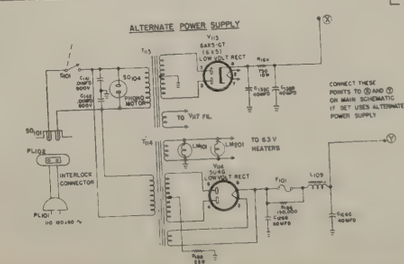
FIG. 29C. VOLTAGE CHART FOR AM TUNER SUB-ASSEMBLY



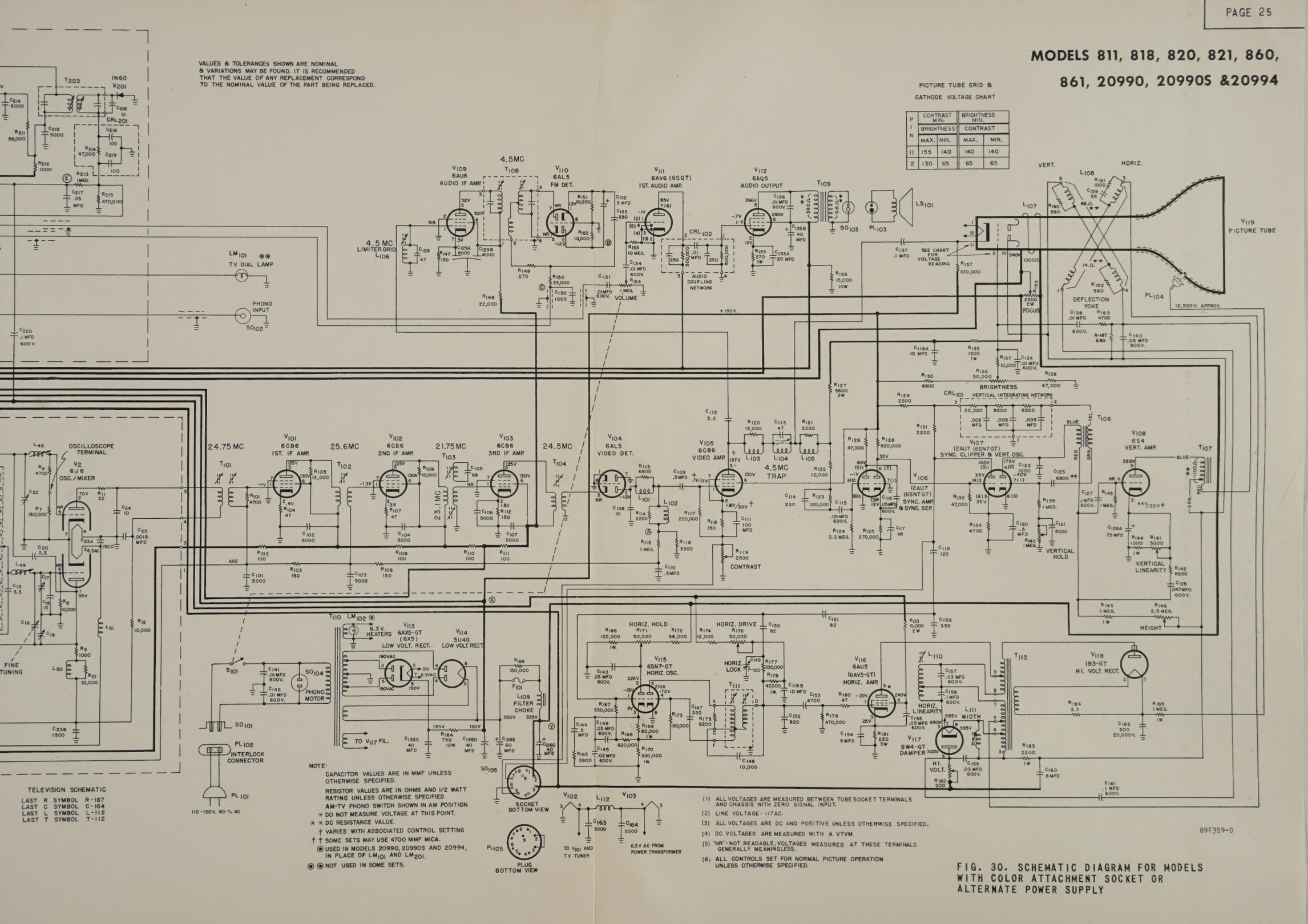

9281289

# MODELS 811, 818, 820, 821, 860, 861, 20990, 20990S &20994

VALUES & TOLERANCES SHOWN ARE NOMINAL & VARIATIONS MAY BE FOUND. IT IS RECOMMENDED THAT THE VALUE OF ANY REPLACEMENT CORRESPOND TO THE NOMINAL VALUE OF THE PART BEING REPLACED.

PICTURE TUBE GRID & CATHODE VOLTAGE CHART

| PIN | CONTRAST MIN. | | BRIGHTNESS MIN. | |
|---|---|---|---|---|
| | BRIGHTNESS | | CONTRAST | |
| | MAX. | MIN. | MAX. | MIN. |
| 11 | 155 | 140 | 140 | 140 |
| 2 | 130 | 65 | 65 | 65 |




NOTE:
CAPACITOR VALUES ARE IN MMF UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES ARE IN OHMS AND 1/2 WATT RATING UNLESS OTHERWISE SPECIFIED
AM-TV PHONO SWITCH SHOWN IN AM POSITION
* DO NOT MEASURE VOLTAGE AT THIS POINT.
* * DC RESISTANCE VALUE.
† VARIES WITH ASSOCIATED CONTROL SETTING
† † SOME SETS MAY USE 4700 MMF MICA.
◉ USED IN MODELS 20990, 20990S AND 20994, IN PLACE OF $LM_{101}$ AND $LM_{201}$.
◉ ◉ NOT USED IN SOME SETS.

(1) ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS WITH ZERO SIGNAL INPUT.
(2) LINE VOLTAGE - 117 AC.
(3) ALL VOLTAGES ARE DC AND POSITIVE UNLESS OTHERWISE SPECIFIED.
(4) DC VOLTAGES ARE MEASURED WITH A VTVM.
(5) "NR"-NOT READABLE. VOLTAGES MEASURED AT THESE TERMINALS GENERALLY MEANINGLESS.
(6) ALL CONTROLS SET FOR NORMAL PICTURE OPERATION UNLESS OTHERWISE SPECIFIED.

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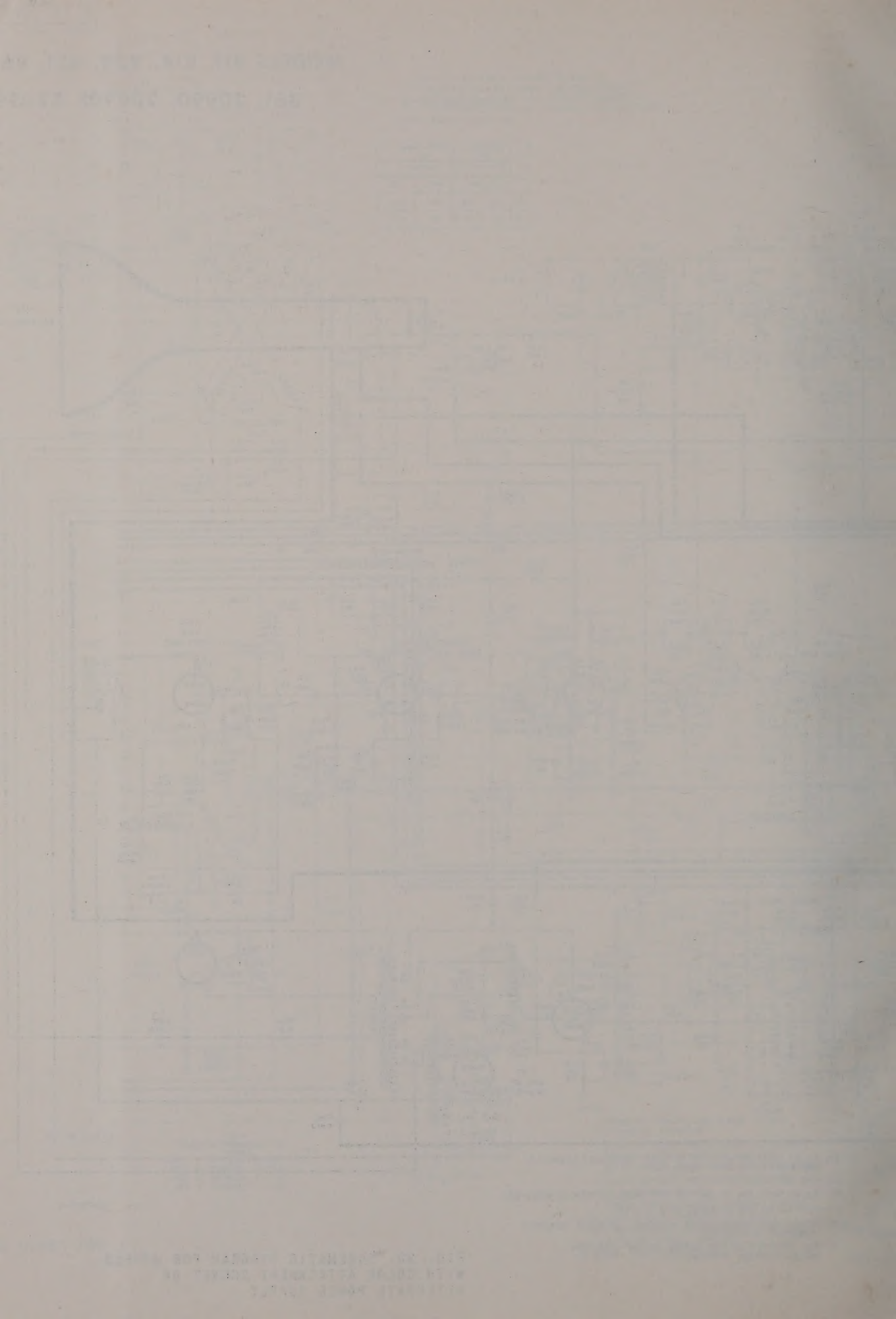
FIG. 30. SCHEMATIC DIAGRAM FOR MODELS WITH COLOR ATTACHMENT SOCKET OR ALTERNATE POWER SUPPLY